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Hálózatok elemzése és vizualizációja

Budapest ML Forum 2023

Milan Janosov

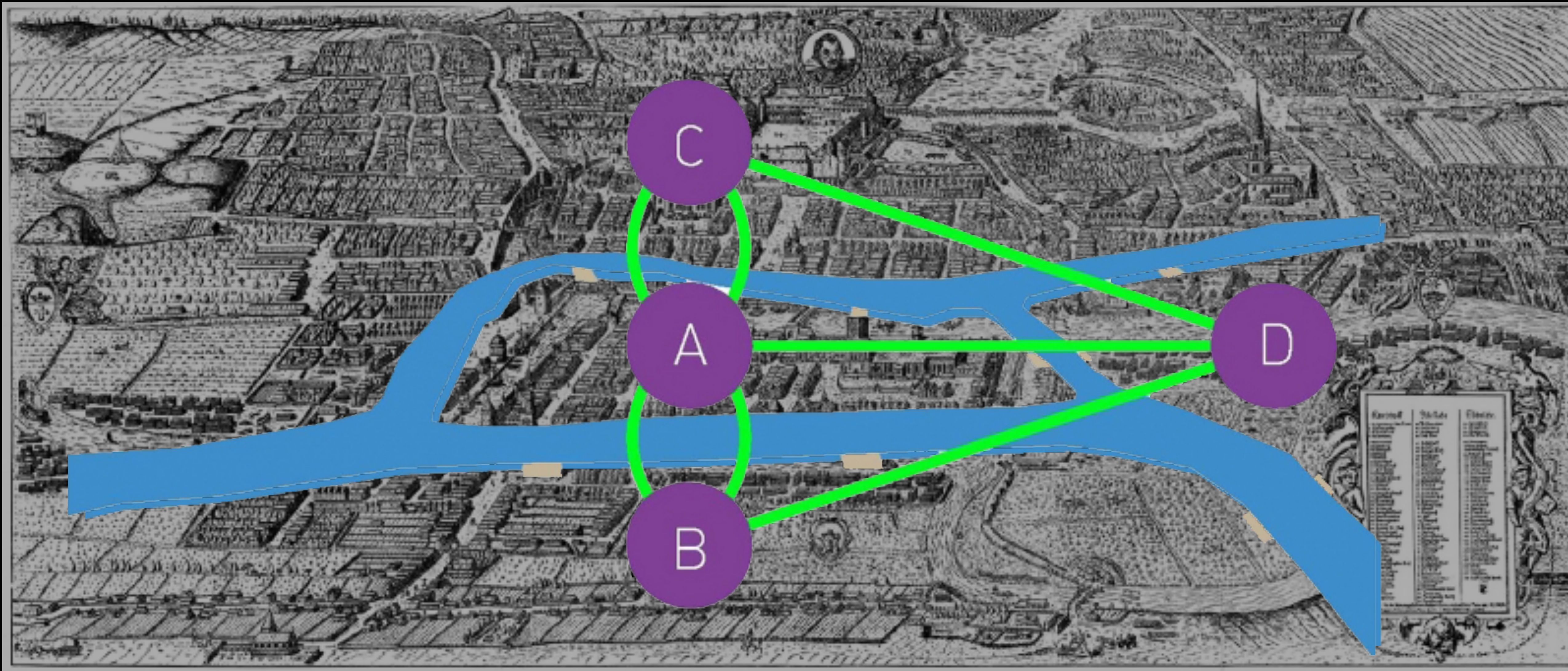
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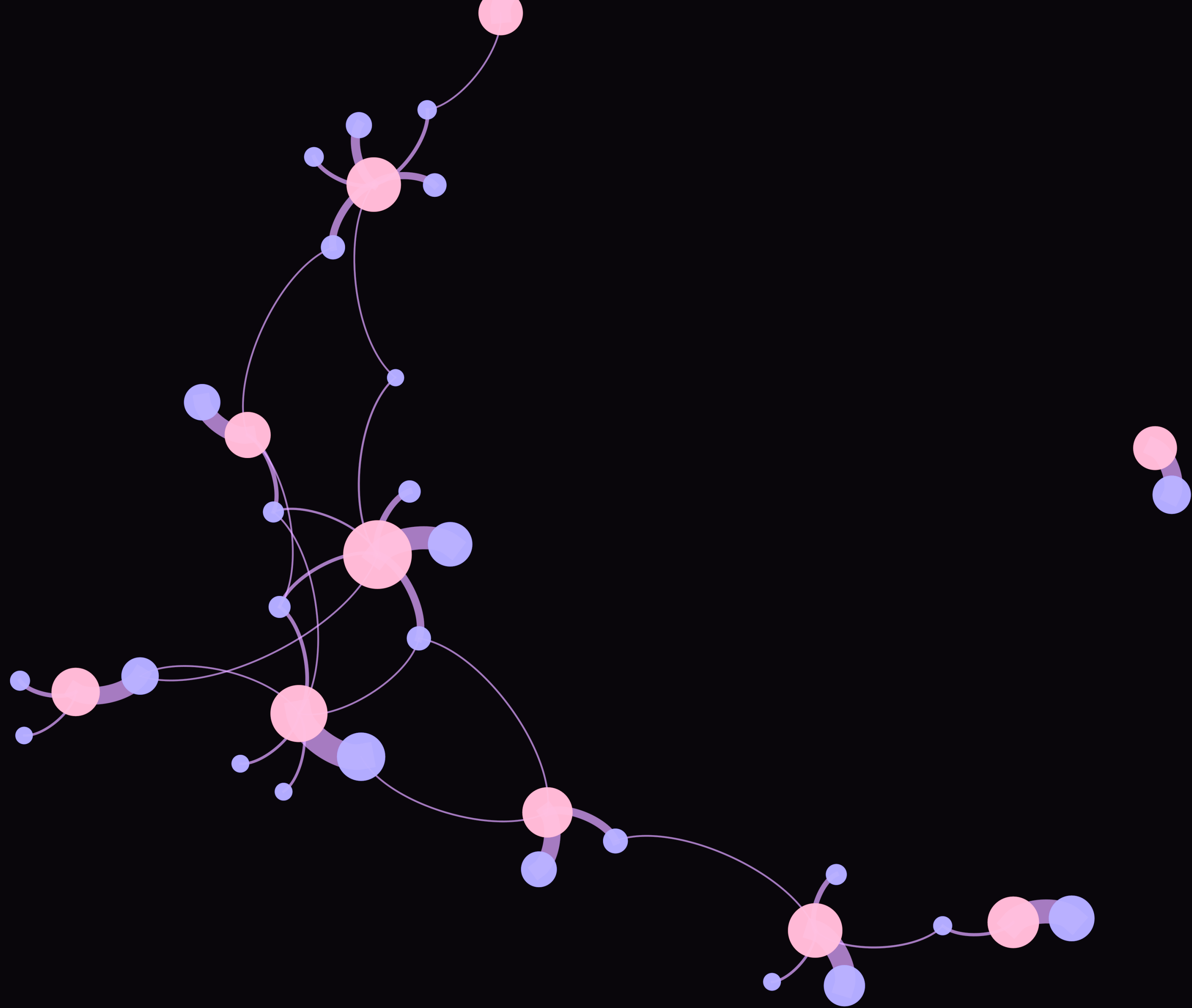
The background features a complex network of thin, light-colored lines connecting numerous small dots, creating a web-like structure. Overlaid on this are several large, flowing, and somewhat chaotic shapes in shades of purple and blue, resembling particle trails or abstract organic forms. The overall aesthetic is futuristic and data-driven.

I. Elméleti kedvcsináló

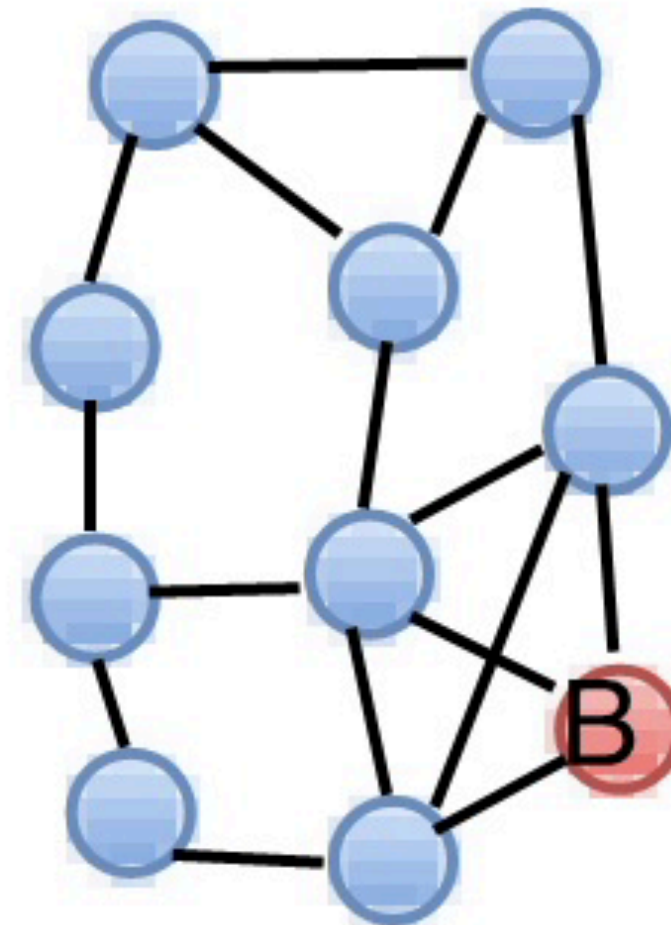
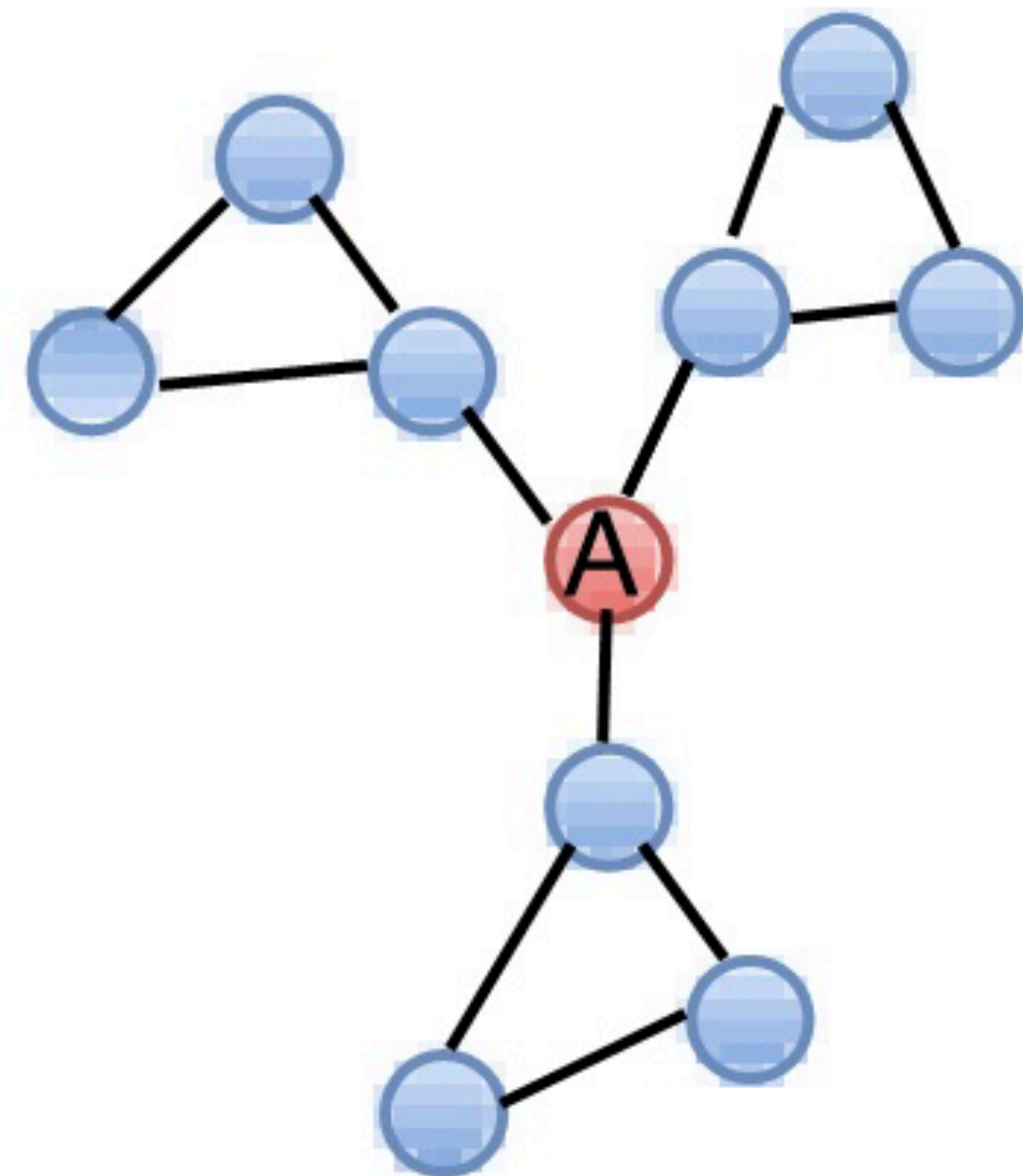
A brief history of network science

Königsberg, 1735



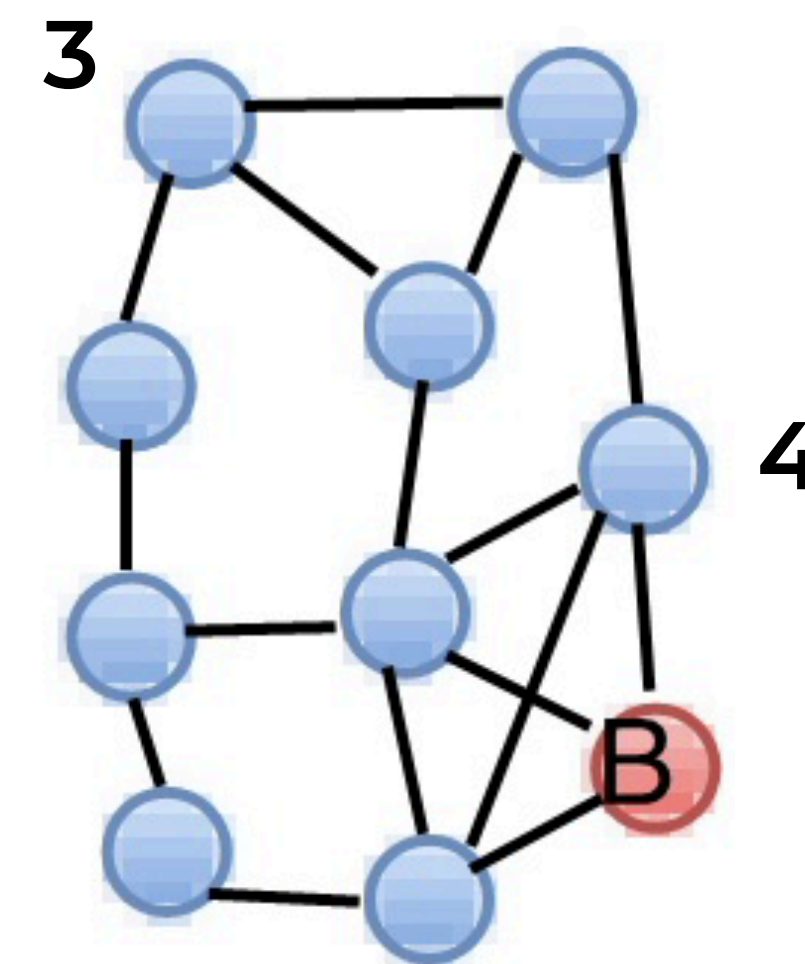
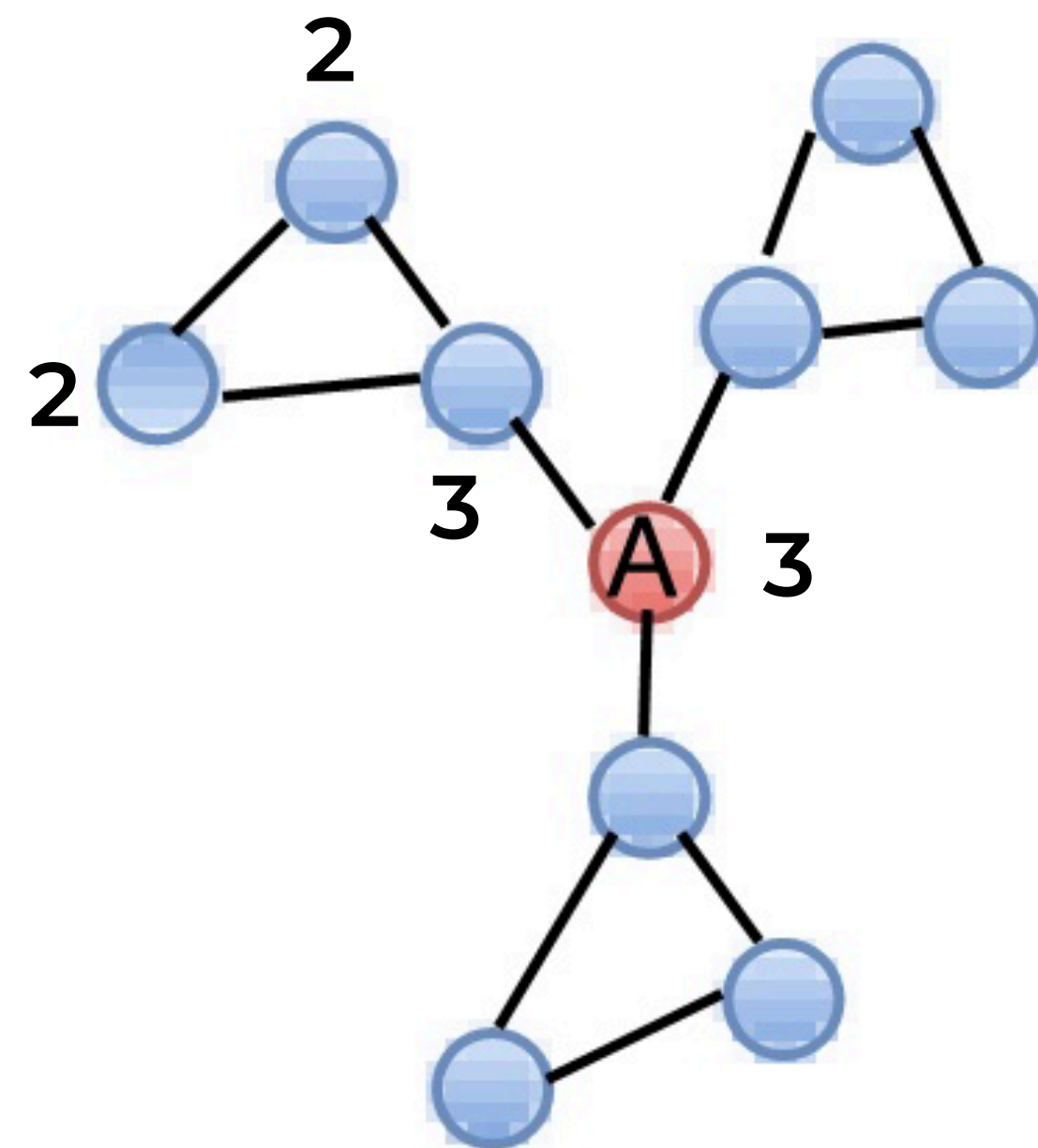


Központiság



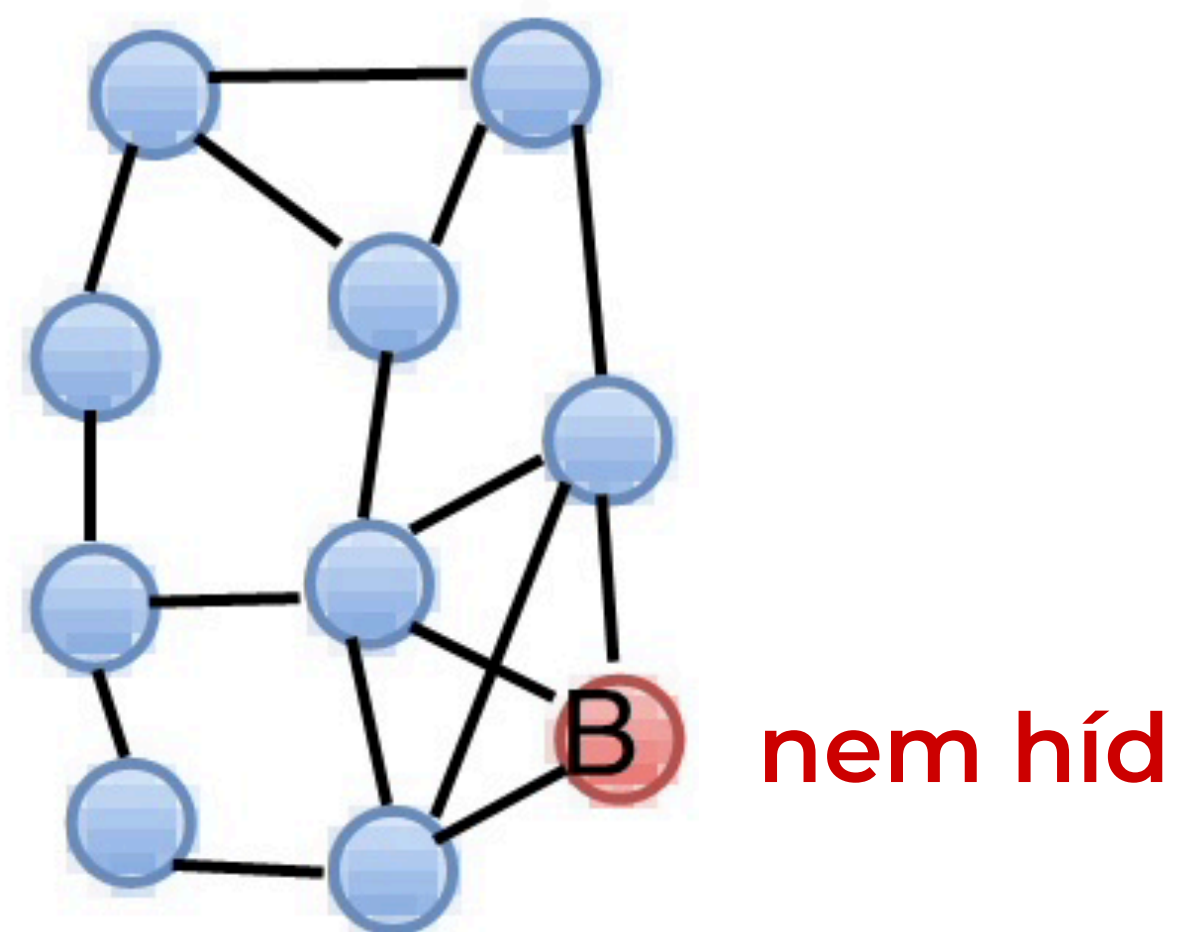
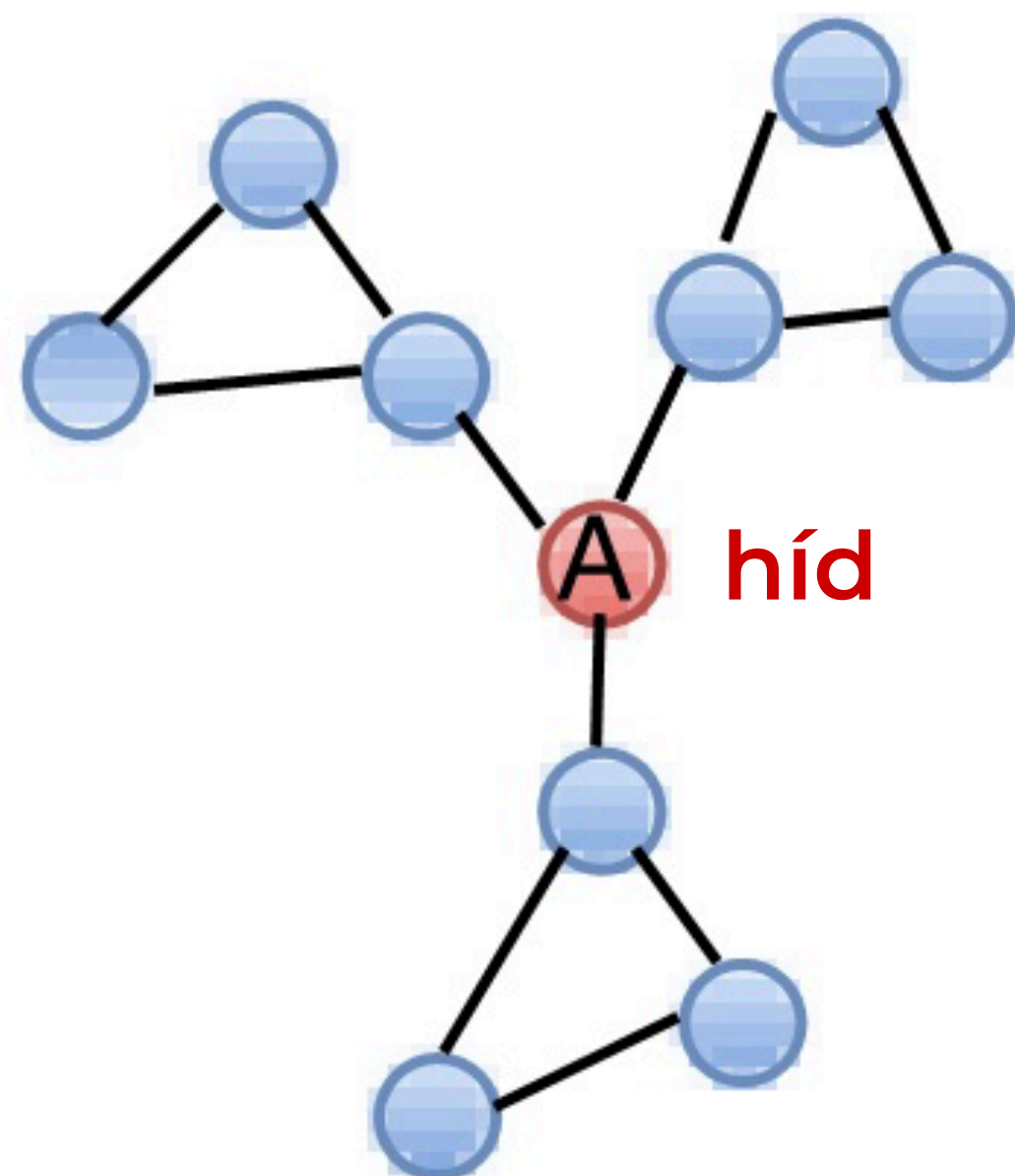
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Kapcsolatok száma és erőssége



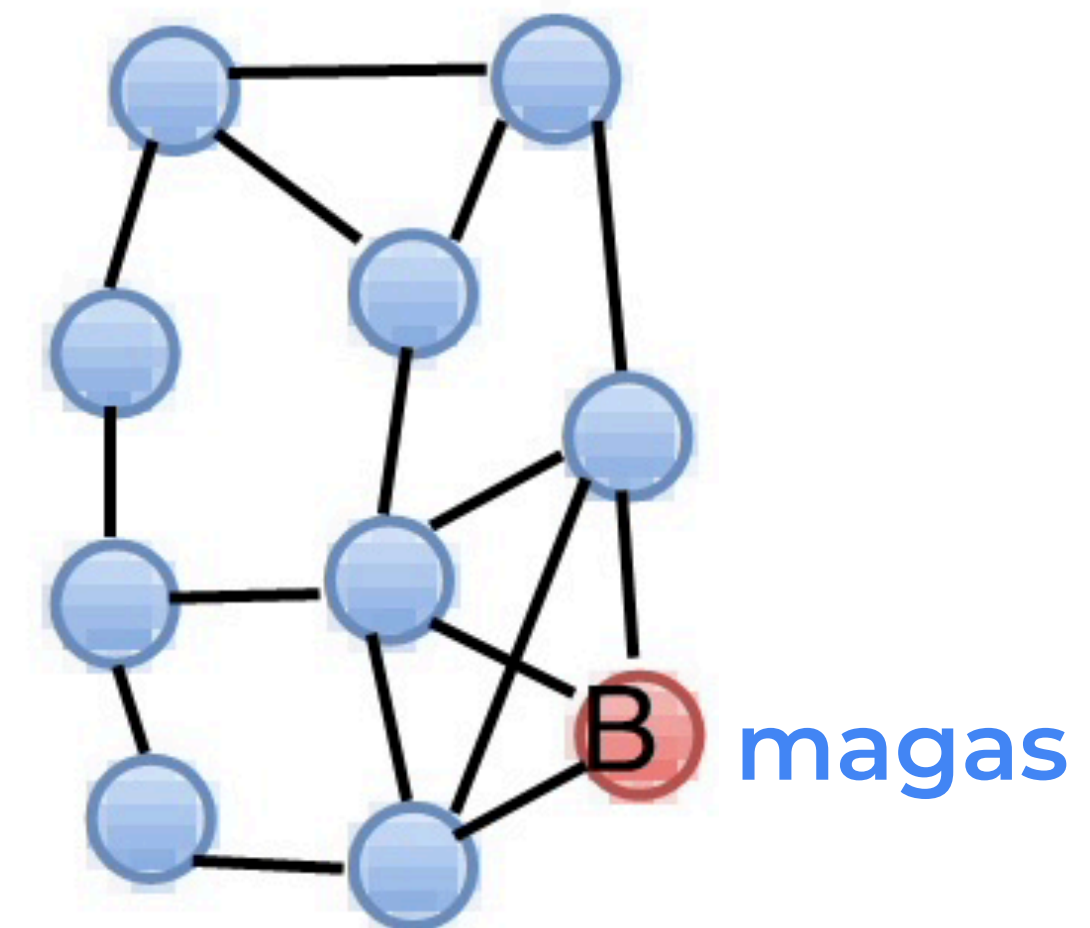
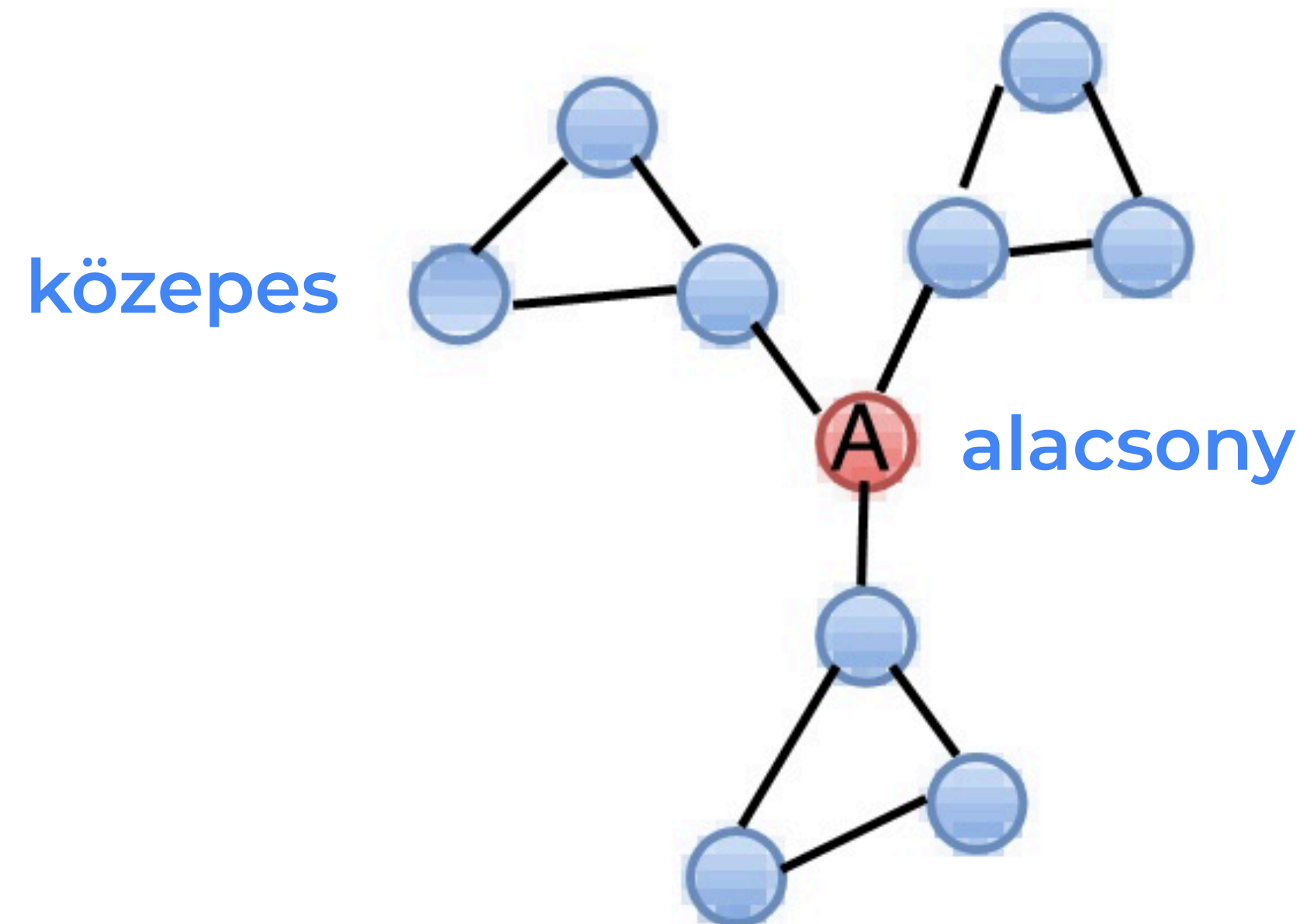
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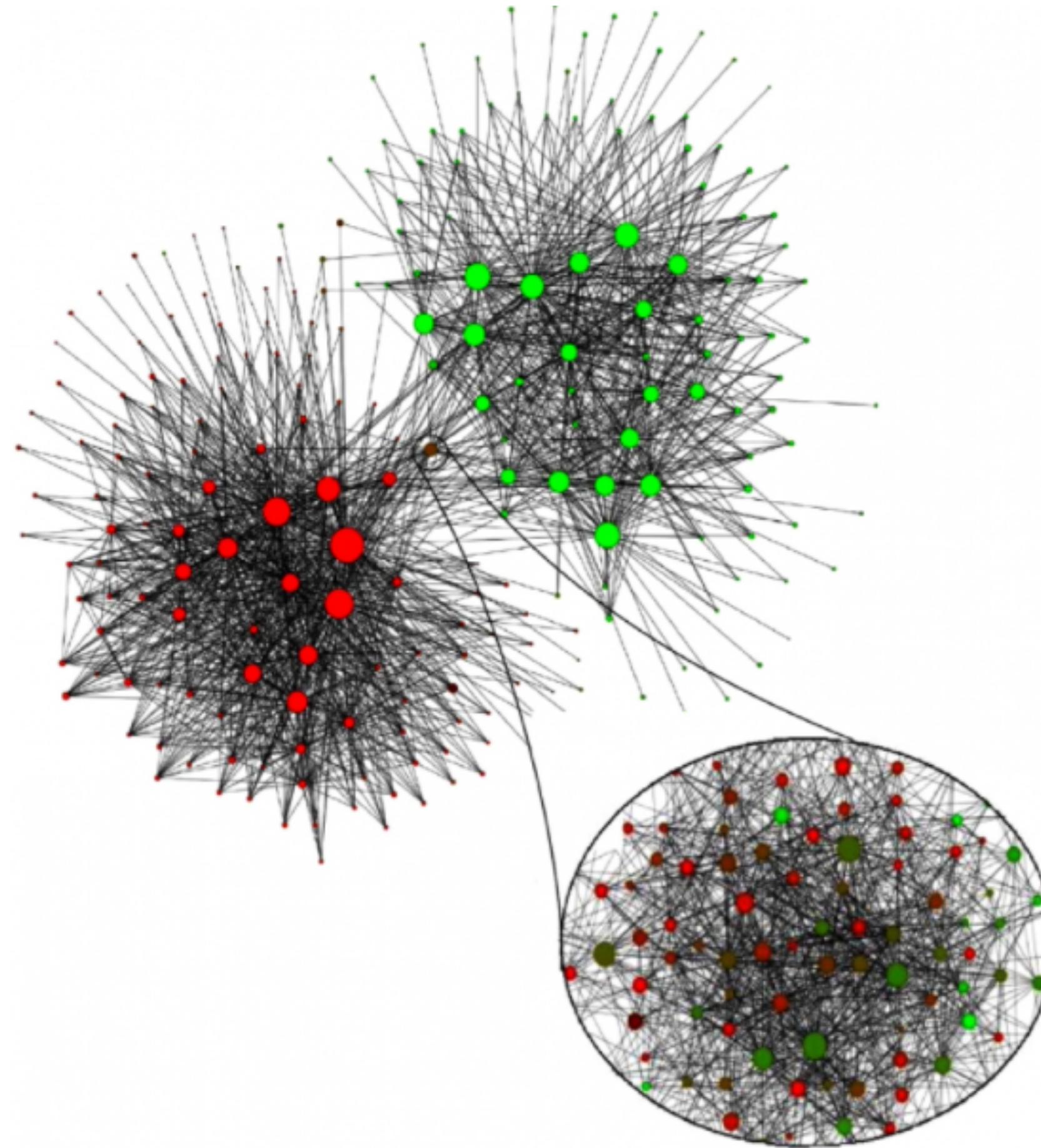


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Beágyazottság

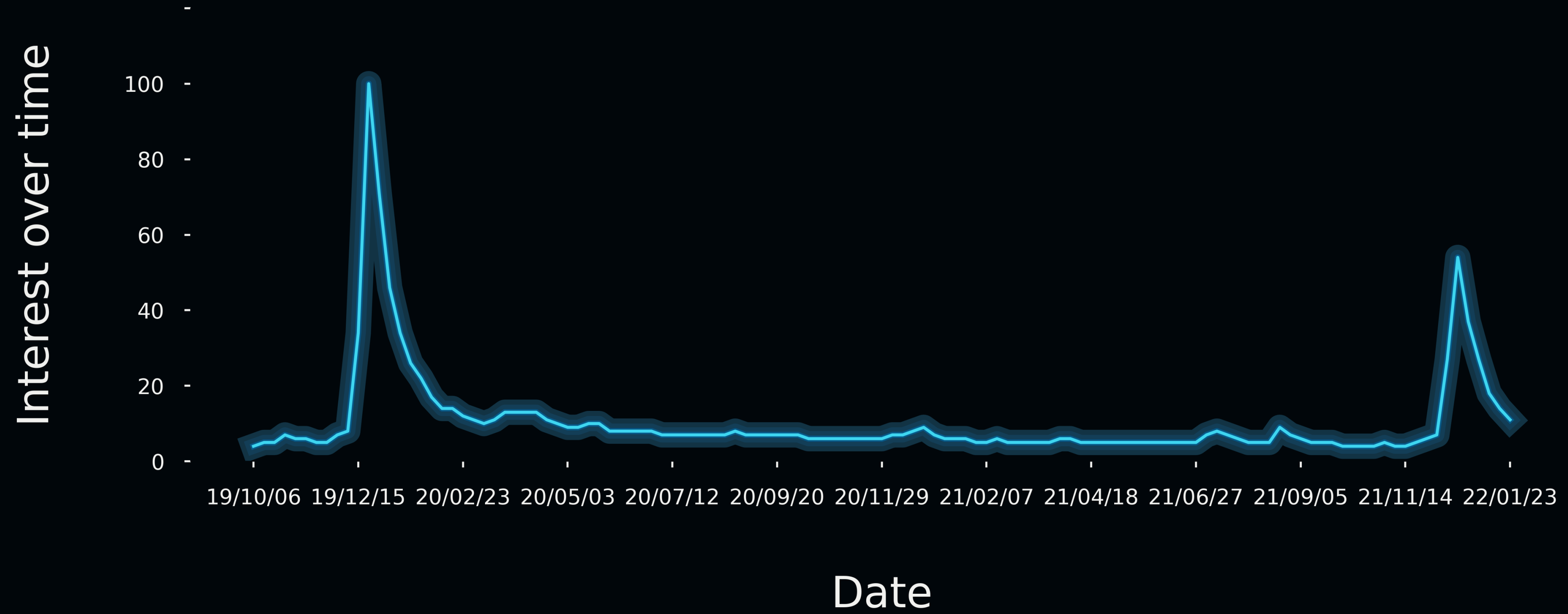


Modularitás



The Witcher's social networks

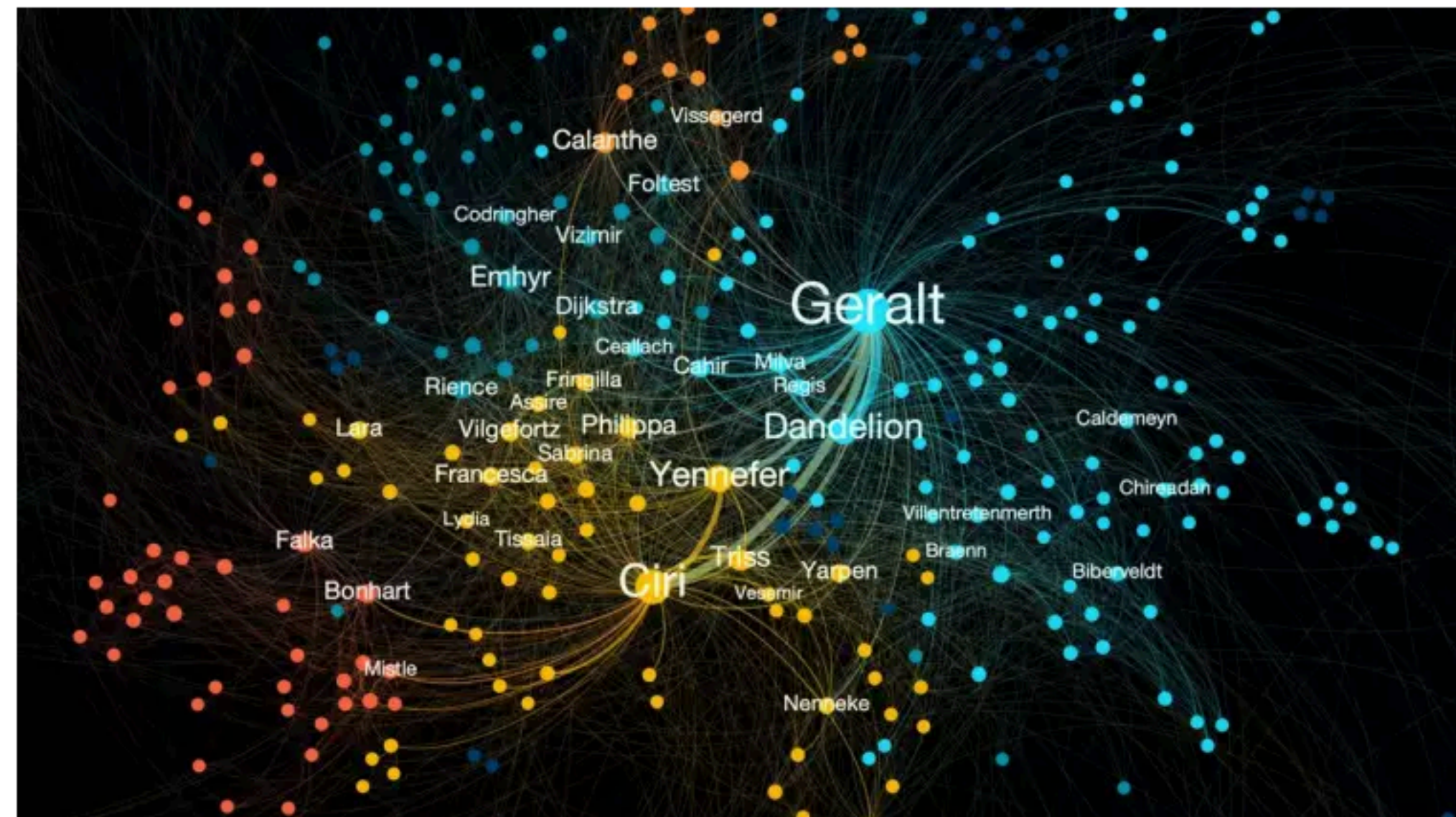
The Witcher's popularity



Data scientist builds a detailed network map of 'The Witcher'

GameStar

HÍREK ELŐZETESÉK TESZTEK #ESPORT EXTRA LIFE



Verily I say unto you, the era of the sword and axe is nigh, the era of the wolf's blizzard. The Time of the White Chill and the White Light is nigh, the Time of Madness and the Time of Contempt: Tedd Deiredhd, the Time of End. The world will die amidst frost and be reborn with the new sun. It will be reborn of the Elder Blood, of Hen Ichaer, of the seed that has been sown. A seed which will not sprout but will burst into flame. Ess\tuath esse! Thus it shall be! Watch for the signs! What signs these shall be, I say unto you: first the earth will flow with the blood of Aen Seidhe, the Blood of Elves ... Aen Ithlinnespeath, Ithlinne Aegli aep Aevenien)'s prophecy I CHAPTER ONE The town was in flames. The narrow streets leading to the moat and the first terrace belched smoke and embers, flames devouring the densely clustered thatched houses and licking at the castle walls. From the west, from the harbour gate, the screams and clamour of vicious battle and the dull blows of a battering ram smashing against the walls grew ever louder. Their attackers had surrounded them unexpectedly, shattering the barricades which had been held by no more than a few soldiers, a handful of townsmen carrying halberds and some crossbowmen from the guild. Their horses, decked out in flowing black caparisons, flew over the barricades like spectres, their riders' bright, glistening blades sowing death amongst the fleeing defenders. Ciri felt the knight who carried her before him on his saddle abruptly spur his horse. She heard his cry. \Hold on!\ he shouted. \Hold on!\ Other knights wearing the colours of Cintra overtook them, sparring, even in full flight, with the Nilfgaardians. Ciri caught a glimpse of the skirmish from the corner of her eye - the crazed swirl of blue-gold and black cloaks amidst the clash of steel, the clatter of blades against shields, the neighing of horses- Shouts. No, not shouts. Screams. \Hold on!\ Fear. With every jolt, every jerk, every leap of the horse pain shot through her hands as she clutched at the reins. Her legs contracted painfully, unable to find support, her eyes watered from the smoke. The arm around her suffocated her, choking her, the force compressing her ribs. All around her screaming such as she had never before heard grew louder. What must one do to a man to make him scream so? Fear. Overpowering, paralysing, choking fear. Again the clash of iron, the grunts and snorts of the horses. The houses whirled around her and suddenly she could see windows belching fire where a moment before there'd been nothing but a muddy little street strewn with corpses and cluttered with the abandoned possessions of the fleeing population. All at once the knight at her back was wracked by a strange wheezing cough. Blood spurted over the hands grasping the reins. More screams. Arrows whistled past. A fall, a shock, painful bruising against armour. Hooves pounded past her, a horse's belly and a frayed girth flashing by above her head, then another horse's belly and a flowing black caparison. Grunts of exertion, like a lumberjack's when chopping wood. But this isn't wood; it's iron against iron. A shout, muffled and dull, and something huge and black collapsed into the mud next to her with a splash, spurting blood. An armoured foot quivered, thrashed, goring the earth with an enormous spur. A jerk. Some force plucked her up, pulled her onto another saddle. Hold on! Again the bone-shaking speed, the mad gallop. Arms and legs desperately searching for support. The horse rears. Hold on! ... There is no support. There is no ... There is no ... There is blood. The horse falls. It's impossible to jump aside, no way to break free, to escape the tight embrace of these chainmail-clad arms. There is no way to avoid the blood pouring onto her head and over her shoulders. A jolt, the squelch of mud, a violent collision with the ground, horrifically still after the furious ride. The horse's harrowing wheezes and squeals as it tries to regain its feet. The pounding of horseshoes, fetlocks and hooves flashing past. Black caparisons and cloaks. Shouting. The street is on fire, a roaring red wall of flame. Silhouetted before it, a rider towers over the flaming roofs, enormous. His black-caparisoned horse prances, tosses its head, neighs. The rider stares down at her. Ciri sees his eyes gleaming through the slit in his huge helmet, framed by a bird of prey's wings. She sees the fire reflected in the broad blade of the sword held in his lowered hand. The rider looks at her. Ciri is unable to move. The dead man's motionless arms wrapped around her waist hold her down. She is locked in place by something heavy and wet with blood, something which is lying across her thigh, pinning her to the ground. And she is frozen in fear: a terrible fear which turns her entrails inside out, which deafens Ciri to the screams of the wounded horse, the roar of the blaze, the cries of dying people and the pounding drums. The only thing which exists, which counts, which still has any meaning, is fear. Fear embodied in the figure of a black knight wearing a helmet decorated with feathers frozen against the wall of raging, red flames. The rider spurs his horse, the wings on his helmet fluttering as the bird of prey takes to flight, launching itself to attack its helpless victim, paralysed with fear. The bird - or maybe the knight -screeches terrifyingly, cruelly, triumphantly. A black horse, black armour, a black flowing cloak, and behind this flames. A sea of flames. Fear. The bird shrieks. The wings beat, feathers slap against her face. Fear! Help! Why doesn't anyone help me? Alone, weak, helpless - I can't move, can't force a sound from my constricted throat. Why does no one come to help me? I'm terrified! Eyes blaze through the slit in the huge winged helmet. The black cloak veils everything. \Ciri!\ She woke, numb and drenched in sweat, with her scream - the scream which had woken her - still hanging in the air, still vibrating somewhere within her, beneath her breast-bone and burning against her parched throat. Her hands ached, clenched around the blanket; her back ached ... \Ciri. 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Amidst the rustling of the trees ... there's music. Lute music. And voices. The Princess of Cintra ... A child of destiny ... A child of Elder Blood, the blood of elves. Geralt of Rivia, the White Wolf, and his destiny. No, no, that's a legend. A poet's invention. The princess is dead. She was killed in the town streets while trying to escape ... Hold on!... Hold ... \Geralt?\ \What, Ciri?\ \What did he do to me? What happened? What did he ... do to me?\ \Who?\ \The knight ... The black knight with feathers on his helmet ... I can't remember anything. He shouted ... and looked at me. I can't remember what happened. Only that I was frightened ... I was so frightened ...' The man leaned over her, the flame of the campfire sparkling in his eyes. They were strange eyes. Very strange. Ciri had been frightened of them, she hadn't liked meeting his gaze. But that had been a long time ago. A very long time ago. \I can't remember anything,\ she whispered, searching for his hand, as tough and coarse as raw wood. \The black knight-\ \It was a dream. Sleep peacefully. It won't come back.\ Ciri had heard such reassurances in the past. They had been repeated to her endlessly; many, many times she had been offered comforting words when her screams had woken her during the night. But this time it was different. Now she believed it. Because it was Geralt of Rivia, the White Wolf, the Witcher, who said it. The man who was her destiny. The one for whom she was destined. Geralt the Witcher, who had found her surrounded by war, death and despair, who had taken her with him and promised they would never part. She fell asleep holding tight to his hand. The bard finished the song. Tilting his head a little he repeated the ballad's refrain on his lute, delicately, softly, a single tone higher than the apprentice accompanying him. No one said a word. Nothing but the subsiding music and the whispering leaves and squeaking boughs of the enormous oak could be heard. Then, all of a sudden, a goat tethered to one of the carts which circled the ancient tree bleated lengthily. At that moment, as if given a signal, one of the men seated in the large semi-circular audience stood up. Throwing his cobalt blue cloak with gold braid trim back over his shoulder, he gave a stiff, dignified bow. \Thank you, Master Dandelion,\ he said, his voice resonant without being loud. \Allow me, Radcliffe of Oxenfurt, Master of the Arcana, to express what I am sure is the opinion of everyone here present and utter words of gratitude and appreciation for your fine art and skill!\ The wizard ran his gaze over those assembled - an audience of well over a hundred people - seated on the ground, on carts, or standing in a tight semi-circle facing the foot of the oak. They nodded and whispered amongst themselves. Several people began to applaud while others greeted the singer with upraised hands. Women, touched by the music, sniffed and wiped their eyes on whatever came to hand, which differed according to their standing, profession and wealth: peasant women used their forearms or the backs of their hands, merchants' wives dabbed their eyes with linen handkerchiefs while elves and noblewomen used kerchiefs of the finest tight-woven cotton, and Baron Vilibert's three daughters, who had, along with the rest of his retinue, halted their falcon hunt to attend the famous troubadour's performance, blew their noses loudly and sonorously into elegant mould-green cashmere scarves. \It would not be an exaggeration to say,\ continued the wizard, \that you have moved us deeply, Master Dandelion. You have prompted us to reflection and thought; you have stirred our hearts. Allow me to express our gratitude, and our respect.\ The troubadour stood and took a bow, sweeping the heron feather pinned to his fashionable hat across his knees. His apprentice broke off his playing, grinned and bowed too, until Dandelion glared at him sternly and snapped something under his breath. The boy lowered his head and returned to softly strumming his lute strings. The assembly stirred to life. The merchants travelling in the caravan whispered amongst themselves and then rolled a sizable cask of beer out to the foot of the oak tree. Wizard Radcliffe lost himself in quiet conversation with Baron Vilibert. Having blown their noses, the baron's daughters gazed at Dandelion in adoration -which went entirely unnoticed by the bard, engrossed as he was in smiling, winking and flashing his teeth at a haughty, silent group of roving elves, and at one of them in particular: a dark-haired, large-eyed beauty sporting a tiny ermine cap. Dandelion had rivals for her attention - the elf, with her huge eyes and beautiful torque hat, had caught his audience's interest as well, and a number of knights, students and goliards were paying court to her with their eyes. The elf clearly enjoyed the attention, picking at the lace cuffs of her chemise and fluttering her eyelashes, but the group of elves with her surrounded her on all sides, not bothering to hide their antipathy towards her admirers. The glade beneath Bleobheris, the great oak, was a place of frequent rallies, a well-known travellers' resting place and meeting ground for wanderers, and was famous for its tolerance and openness. The druids protecting the ancient tree called it the Seat of Friendship and willingly welcomed all comers. But even during an event as exceptional as the world-famous troubadour's just-concluded performance the travellers kept to themselves, remaining in clearly delineated groups. Elves stayed with elves. Dwarfish craftsmen gathered with their kin, who were often hired to protect the merchant caravans and were armed to the teeth. Their groups tolerated at best the gnome miners and halfling farmers who camped beside them. All non-humans were uniformly distant towards humans. The humans repaid in kind, but were not seen to mix amongst themselves either. Nobility looked down on the merchants and travelling salesmen with open scorn, while soldiers and mercenaries distanced themselves from shepherds and their reeking sheepskins. The few wizards and their disciples kept themselves entirely apart from the others, and bestowed their arrogance on everyone in equal parts. A tight-knit, dark and silent group of peasants lurked in the background. Resembling a forest with their rakes, pitchforks and flails poking above their heads, they were ignored by all and sundry. The exception, as ever, was the children. Freed from the constraints of silence which had been enforced during the bard's performance, the children dashed into the woods with wild cries, and enthusiastically immersed themselves in a game whose rules were incomprehensible to all those who had bidden farewell to the happy years of childhood. Children of elves, dwarves, halflings, gnomes, half-elves, quarter-elves and toddlers of mysterious provenance neither knew nor recognised racial or social divisions. At least, not yet. \Indeed!\ shouted one of the knights present in the glade, who was as thin as a beanpole and wearing a red and black tunic emblazoned with three lions passant. \The wizard speaks the truth!\ which differed according to their standing, profession and wealth: peasant women used their forearms or the backs of their hands, merchants' wives dabbed their eyes with linen handkerchiefs while elves and noblewomen used kerchiefs of the finest tight-woven cotton, and Baron Vilibert's three daughters, who had, along with the rest of his retinue, halted their falcon hunt to attend the famous troubadour's performance, blew their noses loudly and sonorously into elegant mould-green cashmere scarves. \It would not be an exaggeration to say,\ continued the wizard, \that you have moved us deeply, Master Dandelion. You have prompted us to reflection and thought; you have stirred our hearts. 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Master Dandelion bestowed an approving smile on the young man for his prudence. \Master!\ shouted a sizeable woman sitting on a cart, the sides of which were painted with a sign for \Vera Loewenhaupt and Sons\, and which was full of wickerwork. Her sons, nowhere to be seen, were no doubt busy wasting away their mother's hard-earned fortune. \Master Dandelion, what is this? Are you going to leave us in suspense? That can't be the end of your ballad? Sing to us of what happened next!\ \Songs and ballads\ the musician bowed - \never end, dear lady, because poetry is eternal and immortal, it knows no beginning, it knows no end-\ \But what happened next?\ The tradeswoman didn't give up, generously rattling coins into the bucket Dandelion's apprentice held out to her. \At least tell us about it, even if you have no wish to sing of it. Your songs mention no names, but we know the witcher you sing of is no other than the famous Geralt of Rivia, and the enchantress for whom he burns with love is the equally famous Yennefer. And the Child Surprise, destined for the witcher and sworn to him from birth, is Cirilla, the unfortunate Princess of Cintra, the town destroyed by the Invaders. Am I right? Dandelion smiled, remaining enigmatic and aloof. \I sing of universal matters, my dear, generous lady,\ he stated. \Of emotions which anyone can experience. Not about specific people.\ \Oh, come on!\ yelled a voice from the crowd. \Everyone knows those songs are about Geralt the Witcher!\ \Yes, yes!\ squealed Baron Vilibert's daughters in chorus, drying their sodden scarves. \Sing on, Master Dandelion! What happened next? Did the witcher and Yennefer the Enchantress find each other in the end? And did they love each other? Were they happy? We want to know!\ \Enough!\ roared the dwarf leader with a growl in his throat, shaking his mighty waist-length, red beard. \It's crap - all these princesses, sorceresses, destiny, love and women's fanciful tales. If you'll pardon the expression, great poet, it's all lies, just a poetic invention to make the story prettier and more touching. But of the deeds of war the massacre and plunder of Cintra, the battles of Marnadal and Sodden - you did sing that mightily, Dandelion! There's no regrets in parting with silver for such a song, a joy to a warrior's heart! And I, Sheldon Skaggs, declare there's not an ounce of lies in what you say - and I can tell the lies from the truth because I was there at Sodden. I stood against the Nilfgaard invaders with an axe in my hand ...'\ \I, Donimir of Troy,\ shouted the thin knight with three lions passant blazoned across his tunic, \was at both battles of Sodden! But I did not see you there, sir dwarf!\ \No doubt because you were looking after the supply train!\ Sheldon Skaggs retorted. \While I was in the front line where things got hot!\ \Mind your tongue, bearded!\ said Donimir of Troy flushing, hitching up his sword belt. \And who you're speaking to!\ \Have a care yourself!\ The dwarf whacked his palm against the axe wedged in his belt, turned to his companions and grinned. \Did you see him there? Frigging knight! See his coat of arms? Ha! Three lions on a shield? Two shitting and the third snorting!\ \Peace, peace!\ A grey-haired druid in a white cloak averted trouble with a sharp, authoritative voice. \This is not fitting, gentlemen! Not here, under Bleobheris' crown, an oak older than all the disputes and quarrels of the world! And not in Poet Dandelion's presence, from whose ballads we ought to learn of love, not contention!\ \Quite so!\ a short, fat priest with a face glistening with sweat seconded the druid. \You look but have no eyes, you listen but have deaf ears. Because divine love is not in you, you are like empty barrels-\ \Speaking of barrels,\ squeaked a long-nosed gnome from his cart, painted with a sign for \Iron hardware, manufacture and sale\, \roll another out, guildsmen! Poet Dandelion's throat is surely dry -and ours too, from all these emotions!\ \Verily, like empty barrels, I tell ye!\ The priest, determined not to be put off, drowned out the ironware gnome. \You have understood nothing of Master Dandelion's ballad, you have learned nothing! You did not see that these ballads speak of man's fate, that we are no more than toys in the hands of the gods, our lands no more than their playground. The ballads about destiny portrayed the destinies of us all, and the legend of Geralt the Witcher and Princess Cirilla - although it is set against the true background of that war - is, after all, a mere metaphor, the creation of a poet's imagination designed to help us-\ \You're talking rubbish, holy man!\ hollered Vera Loewenhaupt from the heights of her cart. \What legend? What imaginative creation? You may not know him, but I know Geralt of Rivia. I saw him with my own eyes in Wyzima, when he broke the spell on King Foltest's daughter. And I met him again later on the Merchants' Trail, where, at Gildia's request, he slew a ferocious griffin which was preying on the caravans and thus saved the lives of many good people. No. This is no legend or fairy-tale. It is the truth, the sincere truth, which Master Dandelion sang for us!\ \I second that,\ said a slender female warrior with her black hair smoothly brushed back and plaited into a thick braid. \I, Rayla of Lyria, also know Geralt the White Wolf, the famous slayer of monsters. And \I've met the enchantress, Lady Yennefer, on several occasions -I used to visit Aedirn and her home town of Vengerberg. I don't know anything about their being in love, though.\ \But it has to be true,\ the attractive elf in the ermine toque. You did not see that these ballads speak of man's fate, that we are no more than toys in the hands of the gods, our lands no more than their playground. 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Verily I say unto you, the era of the sword and axe is nigh, the era of the wolf's blizzard. The Time of the White Chill and the White Light is nigh, the Time of Madness and the Time of Contempt. Tedd Deireddh, the Time of End, The world will die amidst frost and be reborn with the new sun. It will be reborn of the Elder Blood, of Hen Ichaer, of the seed that has been sown. A seed which will not sprout but will burst into flame. Ess\tuath esse! Thus it shall be! Watch for the signs! What signs these shall be, I say unto you: first the earth will flow with the blood of Aen Seidhe, the Blood of Elves ... Aen Ithlinnespeath, Ithlinne Aegli aep Aevenien's prophecy
I CHAPTER ONE
The town was in flames. The narrow streets leading to the moat and the first terrace belched smoke and embers, flames devouring the densely clustered thatched houses and licking at the castle walls. From the west, from the harbour gate, the screams and clamour of vicious battle and the dull blows of a battering ram smashing against the walls grew ever louder. Their attackers had surrounded them unexpectedly, shattering the barricades which had been held by no more than a few soldiers, a handful of townsmen carrying halberds and some crossbowmen from the guild. Their horses, decked out in flowing black caparisons, flew over the barricades like spectres, their riders' bright, glistening blades sowing death amongst the fleeing defenders. Ciri felt the knight who carried her before him on his saddle abruptly spur his horse. She heard his cry. \Hold on!\ he shouted. \Hold on!\ Other knights wearing the colours of Cintra overtook them, sparring, even in full flight, with the Nilfgaardians. Ciri caught a glimpse of the skirmish from the corner of her eye - the crazed swirl of blue-gold and black cloaks amidst the clash of steel, the clatter of blades against shields, the neighing of horses- Shouts. No, not shouts. Screams. \Hold on!\ Fear. With every jolt, every jerk, every leap of the horse pain shot through her hands as she clutched at the reins. Her legs contracted painfully, unable to find support, her eyes watered from the smoke. The arm around her suffocated her, choking her, the force compressing her ribs. All around her screaming such as she had never before heard grew louder. What must one do to a man to make him scream so? Fear. Overpowering, paralysing, choking fear. Again the clash of iron, the grunts and snorts of the horses. The houses whirled around her and suddenly she could see windows belching fire where a moment before there'd been nothing but a muddy little street strewn with corpses and cluttered with the abandoned possessions of the fleeing population. All at once the knight at her back was wracked by a strange wheezing cough. Blood spurted over the hands grasping the reins. More screams. Arrows whistled past. A fall, a shock, painful bruising against armour. Hooves pounded past her, a horse's belly and a frayed girth flashing by above her head, then another horse's belly and a flowing black caparison. Grunts of exertion, like a lumberjack's when chopping wood. But this isn't wood; it's iron against iron. A shout, muffled and dull, and something huge and black collapsed into the mud next to her with a splash, spurting blood. An armoured foot quivered, thrashed, goring the earth with an enormous spur. A jerk. Some force plucked her up, pulled her onto another saddle. Hold on! Again the bone-shaking speed, the mad gallop. Arms and legs desperately searching for support. The horse rears. Hold on! ... There is no support. There is no ... There is no ... There is blood. The horse falls. It's impossible to jump aside, no way to break free, to escape the tight embrace of these chainmail-clad arms. There is no way to avoid the blood pouring onto her head and over her shoulders. A jolt, the squelch of mud, a violent collision with the ground, horrifically still after the furious ride. The horse's harrowing wheezes and squeals as it tries to regain its feet. The pounding of horseshoes, fetlocks and hooves flashing past. Black caparisons and cloaks, Shouting. The street is on fire, a roaring red wall of flame. Silhouetted before it, a rider towers over the flaming roofs, enormous. His black-caparisoned horse prances, tosses its head, neighs. The rider stares down at her. Ciri sees his eyes gleaming through the slit in his huge helmet, framed by a bird of prey's wings. She sees the fire reflected in the broad blade of the sword held in his lowered hand. The rider looks at her. Ciri is unable to move. The dead man's motionless arms wrapped around her waist hold her down. She is locked in place by something heavy and wet with blood, something which is lying across her thigh, pinning her to the ground. And she is frozen in fear: a terrible fear which turns her entrails inside out, which deafens Ciri to the screams of the wounded horse, the roar of the blaze, the cries of dying people and the pounding drums. The only thing which exists, which counts, which still has any meaning, is fear. Fear embodied in the figure of a black knight wearing a helmet decorated with feathers frozen against the wall of raging, red flames. The rider spurs his horse, the wings on his helmet fluttering as the bird of prey takes to flight, launching itself to attack its helpless victim, paralysed with fear. The bird - or maybe the knight -screeches terrifyingly, cruelly, triumphantly. A black horse, black armour, a black flowing cloak, and behind this flames. A sea of flames. Fear. The bird shrieks. The wings beat, feathers slap against her face. Fear! Help! Why doesn't anyone help me? Alone, weak, helpless - I can't move, can't force a sound from my constricted throat. Why does no one come to help me? I'm terrified! Eyes blaze through the slit in the huge winged helmet. The black cloak veils everything- \Ciri!\ She woke, numb and drenched in sweat, with her scream - the scream which had woken her - still hanging in the air, still vibrating somewhere within her, beneath her breast-bone and burning against her parched throat. Her hands ached, clenched around the blanket; her back ached ... \Ciri. 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Not of blood. \Geralt-\ \It was just a dream. A bad dream.\ Ciri shuddered violently, curling her arms and legs up tight. A dream. Just a dream. The campfire had already died down; the birch logs were red and luminous, occasionally crackling, giving off tiny spurts of blue flame which illuminated the white hair and sharp profile of the man wrapping a blanket and sheepskin around her. \Geralt, I-\ \I'm right here. Sleep, Ciri.

You have to rest. We've still a long way ahead of us,\ I can hear music, she thought suddenly. Amidst the rustling of the trees... there's music. Lute music. And voices. The Princess of Cintra ... A child of destiny ... A child of Elder Blood, the blood of elves. Geralt of Rivia, the White Wolf, and his destiny. No, no, that's a legend. A poet's invention. The princess is dead. She was killed in the town streets while trying to

escape ... Hold on...! Hold ... \Geralt?\ \What, Ciri?\ \What did he do to me? What happened? What did he ... do to me?\ \Who?\ \The knight ... The black knight with feathers on his helmet ... I can't remember anything. He shouted ... and looked at me. I can't remember what happened. Only that I was frightened ... I was so frightened ...! The man leaned over her, the flame of the campfire sparkling in his eyes. They were strange eyes. Very strange. Ciri had been frightened of them, she hadn't liked meeting his gaze. But that had been a long time ago. A very long time ago. \I can't remember anything,\ she whispered, searching for his hand, as tough and coarse as raw wood. \The black knight-\ \It was a dream. Sleep peacefully. It won't come back.\ Ciri had heard such reassurances in the past. They had been repeated to her endlessly; many, many times she had been offered comforting words when her screams had woken her during the night. But this time it was different. Now she believed it. Because it was Geralt of Rivia, the White Wolf, the Witcher, who said it. The man who was her destiny. The one for whom she was destined. Geralt the Witcher, who had found her surrounded by war, death and despair, who had taken her with him and promised they would never part. She fell asleep holding tight to his hand. The bard finished the song. Tilting his head a little he repeated the ballad's refrain on his lute, delicately, softly, a single tone higher than the apprentice accompanying him. No one said a word. Nothing but the subsiding music and the whispering leaves and squeaking boughs of the enormous oak could be heard. Then, all of a sudden, a goat tethered to one of the carts which circled the ancient tree bleated lengthily. At that moment, as if given a signal, one of the men seated in the large semi-circular audience stood up. Throwing his cobalt blue cloak with gold braid trim back over his shoulder, he gave a stiff, dignified bow. \Thank you, Master Dandelion,\ he said, his voice resonant without being loud. \Allow me, Radcliffe of Oxenfurt, Master of the Arcana, to express what I am sure is the opinion of everyone here present and utter words of gratitude and appreciation for your fine art and skill!\ The wizard ran his gaze over those assembled - an audience of well over a hundred people - seated on the ground, on carts, or standing in a tight semi-circle facing the foot of the oak. They nodded and whispered amongst themselves. Several people began to applaud while others greeted the singer with upraised hands. Women, touched by the music, sniffed and wiped their eyes on whatever came to hand, which differed according to their standing, profession and wealth: peasant women used their forearms or the backs of their hands, merchants' wives dabbed their eyes with linen handkerchiefs while elves and noblewomen used kerchiefs of the finest tight-woven cotton, and Baron Vilibert's three daughters, who had, along with the rest of his retinue, halted their falcon hunt to attend the famous troubadour's performance, blew their noses loudly and sonorously into elegant mould-green cashmere scarves. \It would not be an exaggeration to say,\ continued the wizard, \that you have moved us deeply, Master Dandelion. You have prompted us to reflection and thought; you have stirred our hearts. Allow me to express our gratitude, and our respect.\ The troubadour stood and took a bow, sweeping the heron feather pinned to his fashionable hat across his knees. His apprentice broke off his playing, grinned and bowed too, until Dandelion glared at him sternly and snapped something under his breath. The boy lowered his head and returned to softly strumming his lute strings. The assembly stirred to life. The merchants travelling in the caravan whispered amongst themselves and then rolled a sizable cask of beer out to the foot of the oak tree. Wizard Radcliffe lost himself in quiet conversation with Baron Vilibert. Having blown their noses, the baron's daughters gazed at Dandelion in adoration -which went entirely unnoticed by the bard, engrossed as he was in smiling, winking and flashing his teeth at a haughty, silent group of roving elves, and at one of them in particular: a dark-haired, large-eyed beauty sporting a tiny ermine cap. Dandelion had rivals for her attention - the elf, with her huge eyes and beautiful torque hat, had caught his audience's interest as well, and a number of knights, students and goliards were paying court to her with their eyes. The elf clearly enjoyed the attention, picking at the lace cuffs of her chemise and fluttering her eyelashes, but the group of elves with her surrounded her on all sides, not bothering to hide their antipathy towards her admirers. The glade beneath Bleobheris, the great oak, was a place of frequent rallies, a well-known travellers' resting place and meeting ground for wanderers, and was famous for its tolerance and openness. The druids protecting the ancient tree called it the Seat of Friendship and willingly welcomed all comers. But even during an event as exceptional as the world-famous troubadour's just-concluded performance the travellers kept to themselves, remaining in clearly delineated groups. Elves stayed with elves. Dwarfish craftsmen gathered with their kin, who were often hired to protect the merchant caravans and were armed to the teeth. Their groups tolerated at best the gnome miners and halfling farmers who camped beside them. All non-humans were uniformly distant towards humans. The humans repaid in kind, but were not seen to mix amongst themselves either. Nobility looked down on the merchants and travelling salesmen with open scorn, while soldiers and mercenaries distanced themselves from shepherds and their reeking sheepskins. The few wizards and their disciples kept themselves entirely apart from the others, and bestowed their arrogance on everyone in equal parts. A tight-knit, dark and silent group of peasants lurked in the background. Resembling a forest with their rakes, pitchforks and flails poking above their heads, they were ignored by all and sundry. The exception, as ever, was the children. Freed from the constraints of silence which had been enforced during the bard's performance, the children dashed into the woods with wild cries, and enthusiastically immersed themselves in a game whose rules were incomprehensible to all those who had bidden farewell to the happy years of childhood. Children of elves, dwarves, halflings, gnomes, half-elves, quarter-elves and toddlers of mysterious provenance neither knew nor recognised racial or social divisions. At least, not yet. \Indeed!\ shouted one of the knights present in the glade, who was as thin as a beanpole and wearing a red and black tunic emblazoned with three lions passant. \The wizard speaks the truth! which differed according to their standing, profession and wealth: peasant women used their forearms or the backs of their hands, merchants' wives dabbed their eyes with linen handkerchiefs while elves and noblewomen used kerchiefs of the finest tight-woven cotton, and Baron Vilibert's three daughters, who had, along with the rest of his retinue, halted their falcon hunt to attend the famous troubadour's performance, blew their noses loudly and sonorously into elegant mould-green cashmere scarves. \It would not be an exaggeration to say,\ continued the wizard, \that you have moved us deeply, Master Dandelion. You have prompted us to reflection and thought; you have stirred our hearts. 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Master Dandelion bestowed an approving smile on the young man for his prudence. \Master!\ shouted a sizeable woman sitting on a cart, the sides of which were painted with a sign for \Vera Loewenhaupt and Sons\, and which was full of wickerwork. Her sons, nowhere to be seen, were no doubt busy wasting away their mother's hard-earned fortune. \Master Dandelion, what is this? Are you going to leave us in suspense? That can't be the end of your ballad? Sing to us of what happened next!\ \Songs and ballads\ the musician bowed - \never end, dear lady, because poetry is eternal and immortal, it knows no beginning, it knows no end-\ \But what happened next?\ The tradeswoman didn't give up, generously rattling coins into the bucket Dandelion's apprentice held out to her. \At least tell us about it, even if you have no wish to sing of it. Your songs mention no names, but we know the witcher you sing of is no other than the famous Geralt of Rivia, and the enchantress for whom he burns with love is the equally famous Yennefer. And the Child Surprise, destined for the witcher and sworn to him from birth, is Cirilla, the unfortunate Princess of Cintra, the town destroyed by the Invaders. Am I right?\ Dandelion smiled, remaining enigmatic and aloof. \I sing of universal matters, my dear, generous lady!\ he stated. \Of emotions which anyone can experience. Not about specific people!\ \Oh, come on!\ yelled a voice from the crowd. \Everyone knows those songs are about Geralt the Witcher!\ \Yes, yes!\ squealed Baron Vilibert's daughters in chorus, drying their sodden scarves. \Sing on, Master Dandelion! What happened next? Did the witcher and Yennefer the Enchantress find each other in the end? And did they love each other? Were they happy? We want to know!\ \Enough!\ roared the dwarf leader with a growl in his throat, shaking his mighty waist-length, red beard. \It's crap - all these princesses, sorceresses, destiny, love and women's fanciful tales. If you'll pardon the expression, great poet, it's all lies, just a poetic invention to make the story prettier and more touching. But of the deeds of war the massacre and plunder of Cintra, the battles of Marnadal and Sodden - you did sing that mightily, Dandelion! There's no regrets in parting with silver for such a song, a joy to a warrior's heart! And I, Sheldon Skaggs, declare there's not an ounce of lies in what you say - and I can tell the lies from the truth because I was there at Sodden. I stood against the Nilfgaard invaders with an axe in my hand ...' \I, Donimir of Troy,\ shouted the thin knight with three lions passant blazoned across his tunic, \was at both battles of Sodden! But I did not see you there, sir dwarf!\ \No doubt because you were looking after the supply train!\ Sheldon Skaggs retorted. \While I was in the front line where thivings got hot!\ \Mind your tongue, beardy!\ said Donimir of Troy flushing, hitching up his sword belt. \And who you're speaking to!\ \Have a care yourself!\ The dwarf whacked his palm against the axe wedged in his belt, turned to his companions and grinned. \Did you see him there? Frigging knight! See his coat of arms? Ha! Three lions on a shield? Two shitting and the third snarling!\ \Peace, peace!\ A grey-haired druid in a white cloak averted trouble with a sharp, authoritative voice. \This is not fitting, gentlemen! Not here, under Bleobheris' crown, an oak older than all the disputes and quarrels of the world! And not in Poet Dandelion's presence, from whose ballads we ought to learn of love, not contention!\ \Quite so!\ a short, fat priest with a face glistening with sweat seconded the druid. \You look but have no eyes, you listen but have deaf ears. Because divine love is not in you, you are like empty barrels-\ \Speaking of barrels,\ squeaked a long-nosed gnome from his cart, painted with a sign for \Iron hardware, manufacture and sale!\ \roll another out, guildsmen! Poet Dandelion's throat is surely dry -and ours too, from all these emotions!\ \Verily, like empty barrels, I tell ye!\ The priest, determined not to be put off, drowned out the ironware gnome. \You have understood nothing of Master Dandelion's ballad, you have learned nothing! You did not see that these ballads speak of man's fate, that we are no more than toys in the hands of the gods, our lands no more than their playground. 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Take-away

Transform unstructured data into social networks

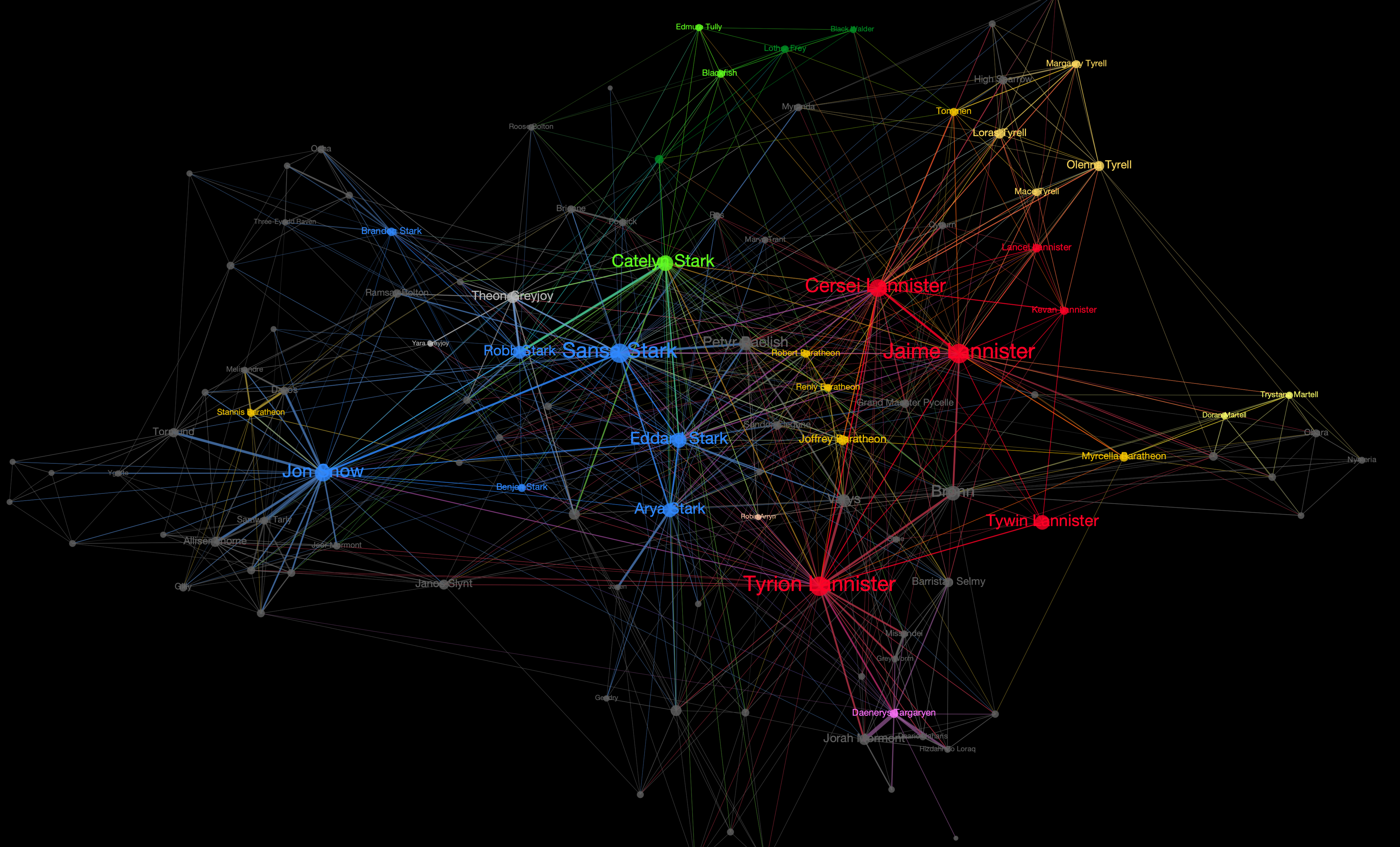
Who dies next in the Game of Thrones?

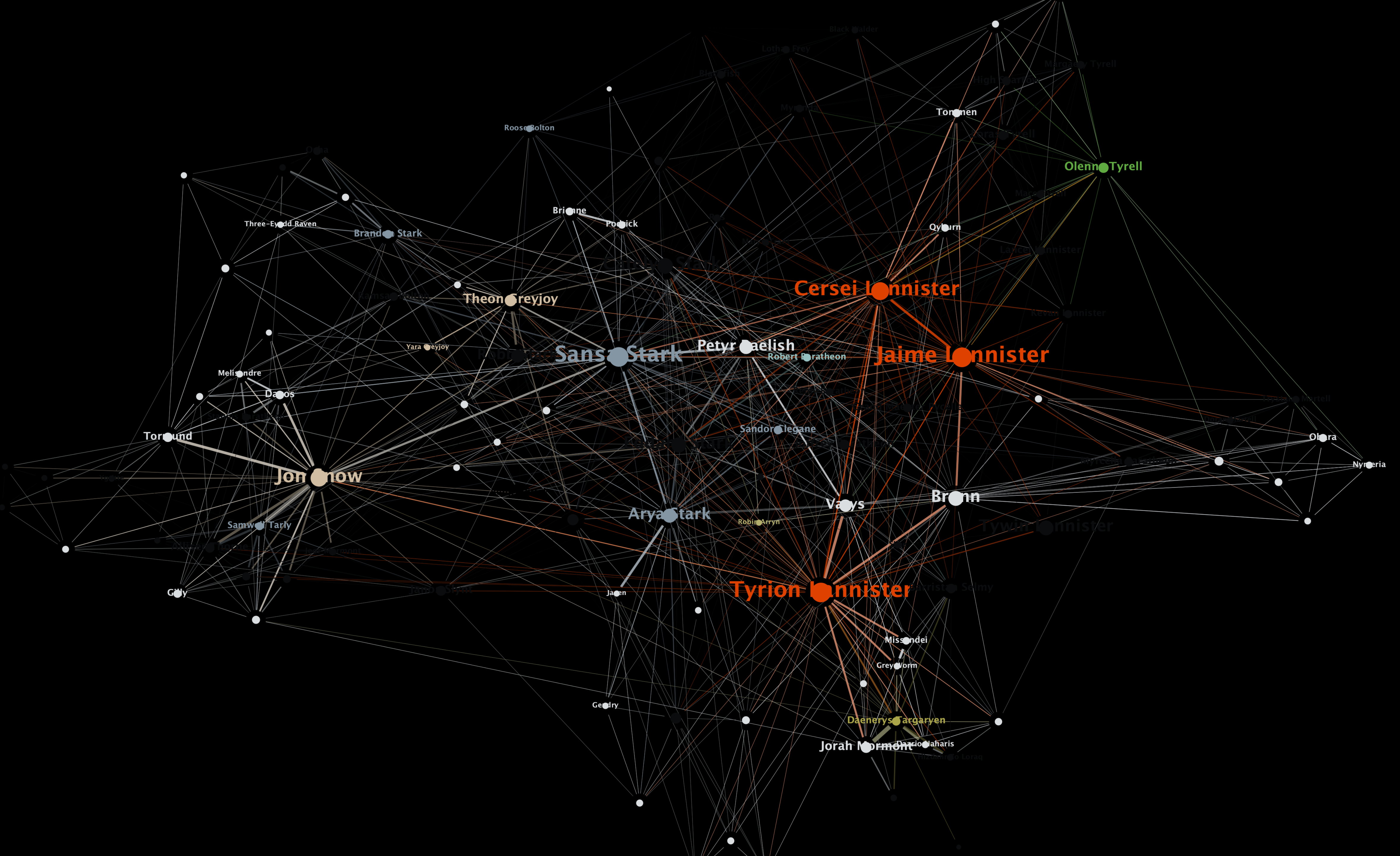


LOOK GOOD LIVE WELL GET SMART ENTERTAINMENT MEN OF THE YEAR BINGE WATCH VISUAL STORIES

POP CULTURE

There's an algorithm that (rather accurately) predicts the death of your favourite Game of Thrones characters





The network prediction recipe

1. Describe nodes by centrality features
2. Add other meta info
3. Label them based on survived/not
4. Do a binary classification
5. And get feature importance scores

A complex network graph with nodes and edges, overlaid with text. The nodes are represented by small circles, and the edges are thin lines connecting them. The graph is dense and interconnected. The text is overlaid on the graph, with some nodes highlighted in a darker color.

Take-away

Forecast the future state of nodes

Wildlife network



Names - common, scientific, regions etc...



Advanced ?

AMAZING SPECIES



ANIMALIA - AVES

African Penguin

Spheniscus demersus

↓ Decreasing

GLOBAL



PLANTAE - MAGNOLIOPSIDA

Mammillaria herrerae

Mammillaria herrerae

↓ Decreasing

GLOBAL



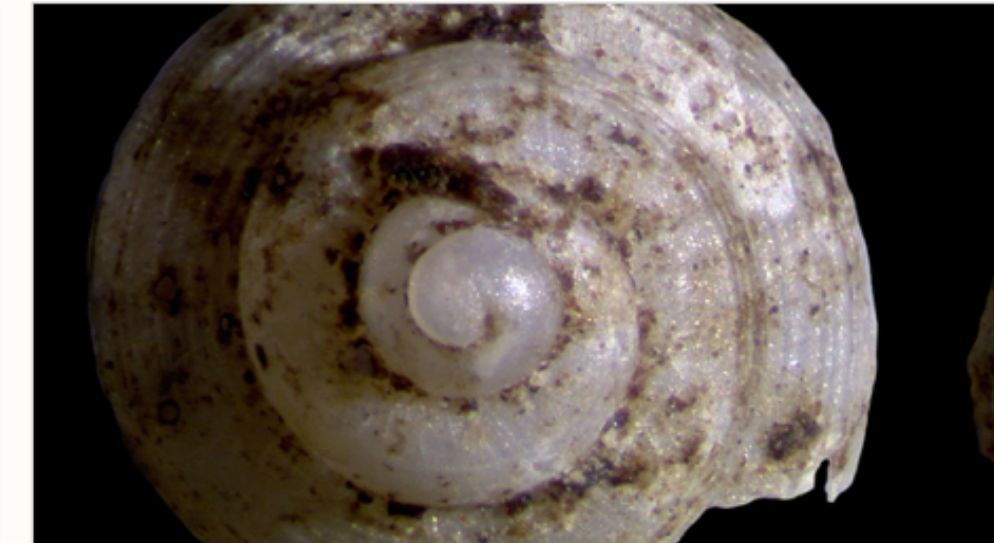
ANIMALIA - MAMMALIA

Patagonian Huemul

Hippocamelus bisulcus

↓ Decreasing

GLOBAL



ANIMALIA - GASTROPODA

Cyathopoma picardense

Cyathopoma picardense

↓ Decreasing

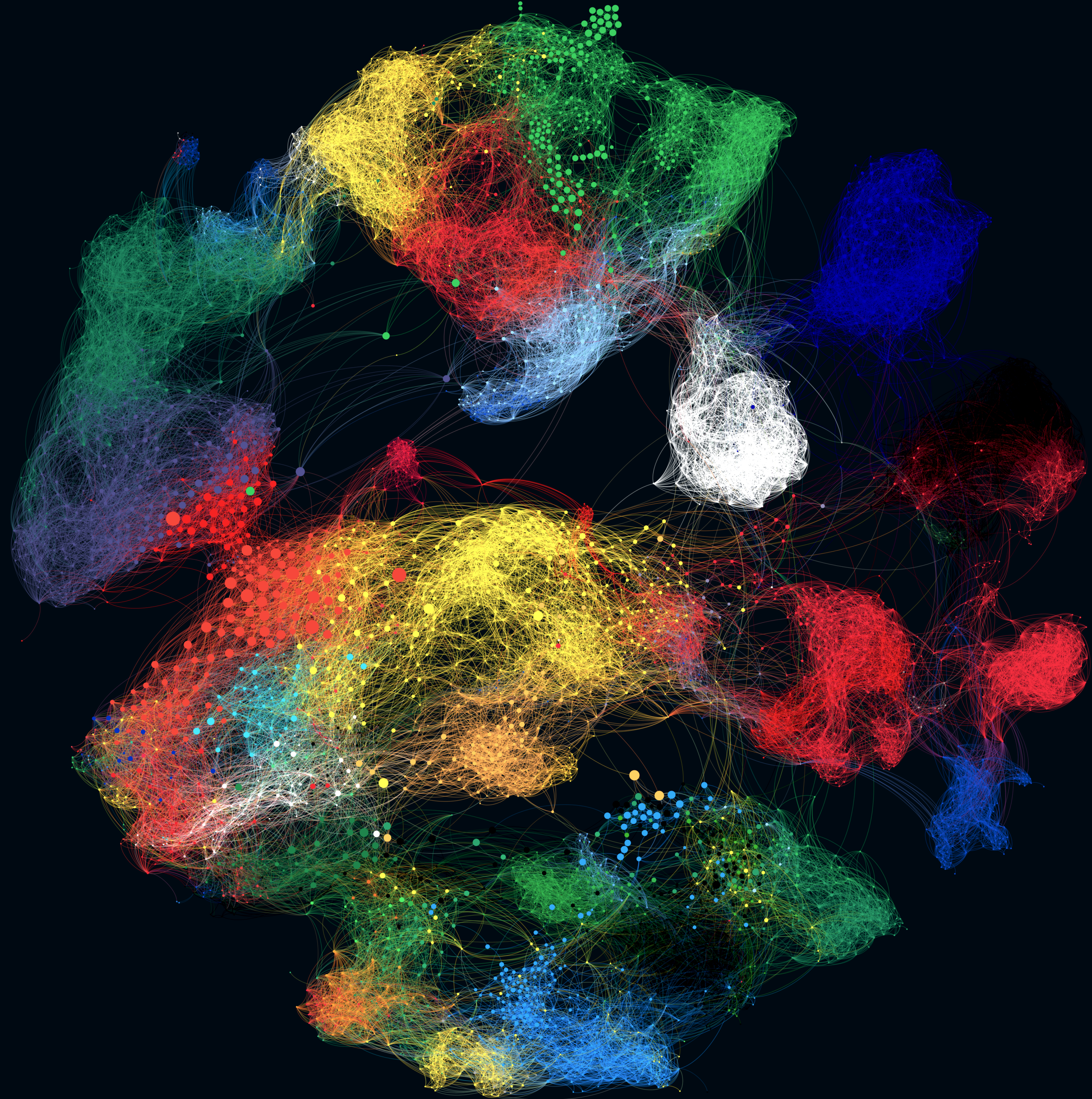
GLOBAL

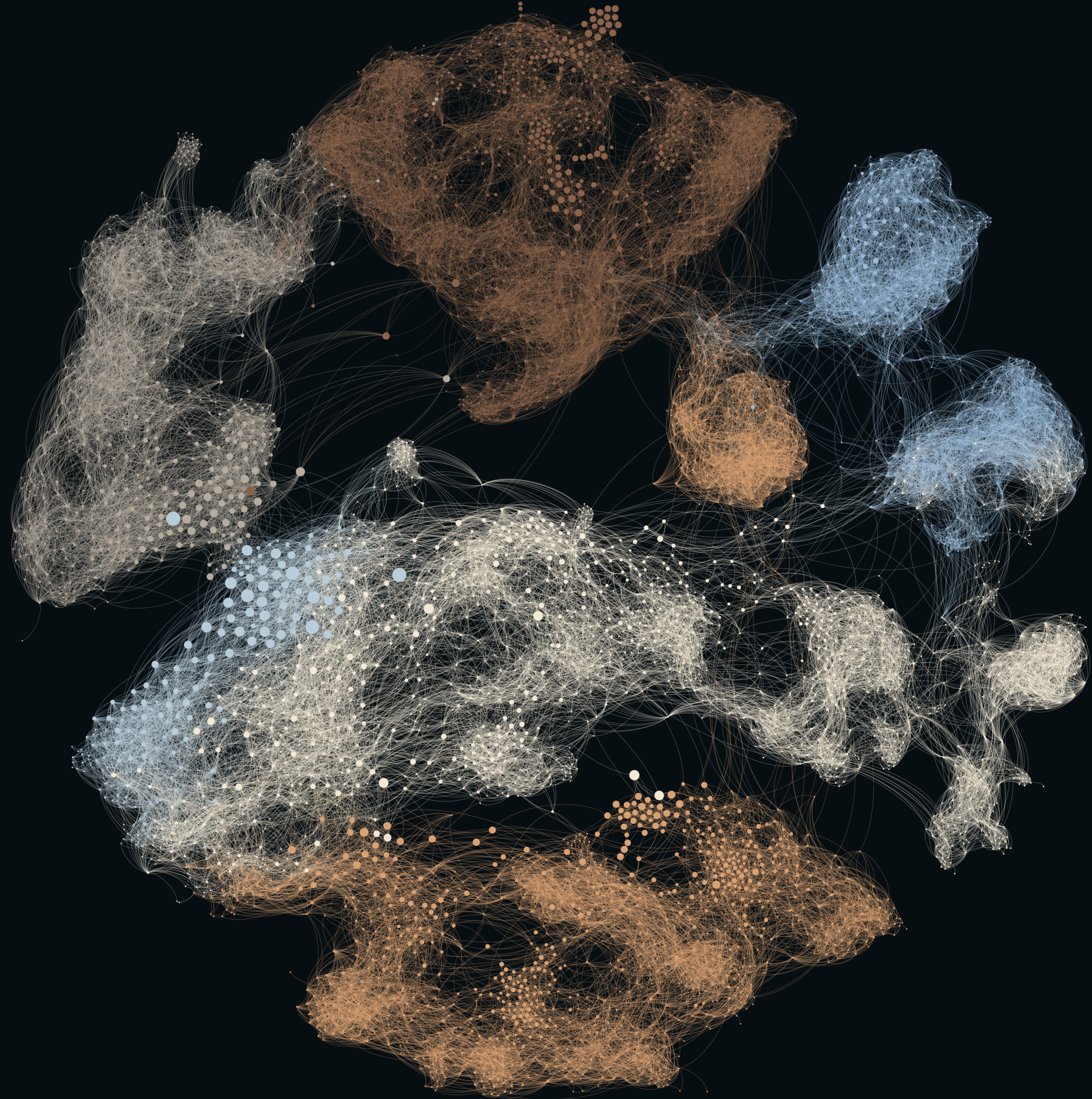


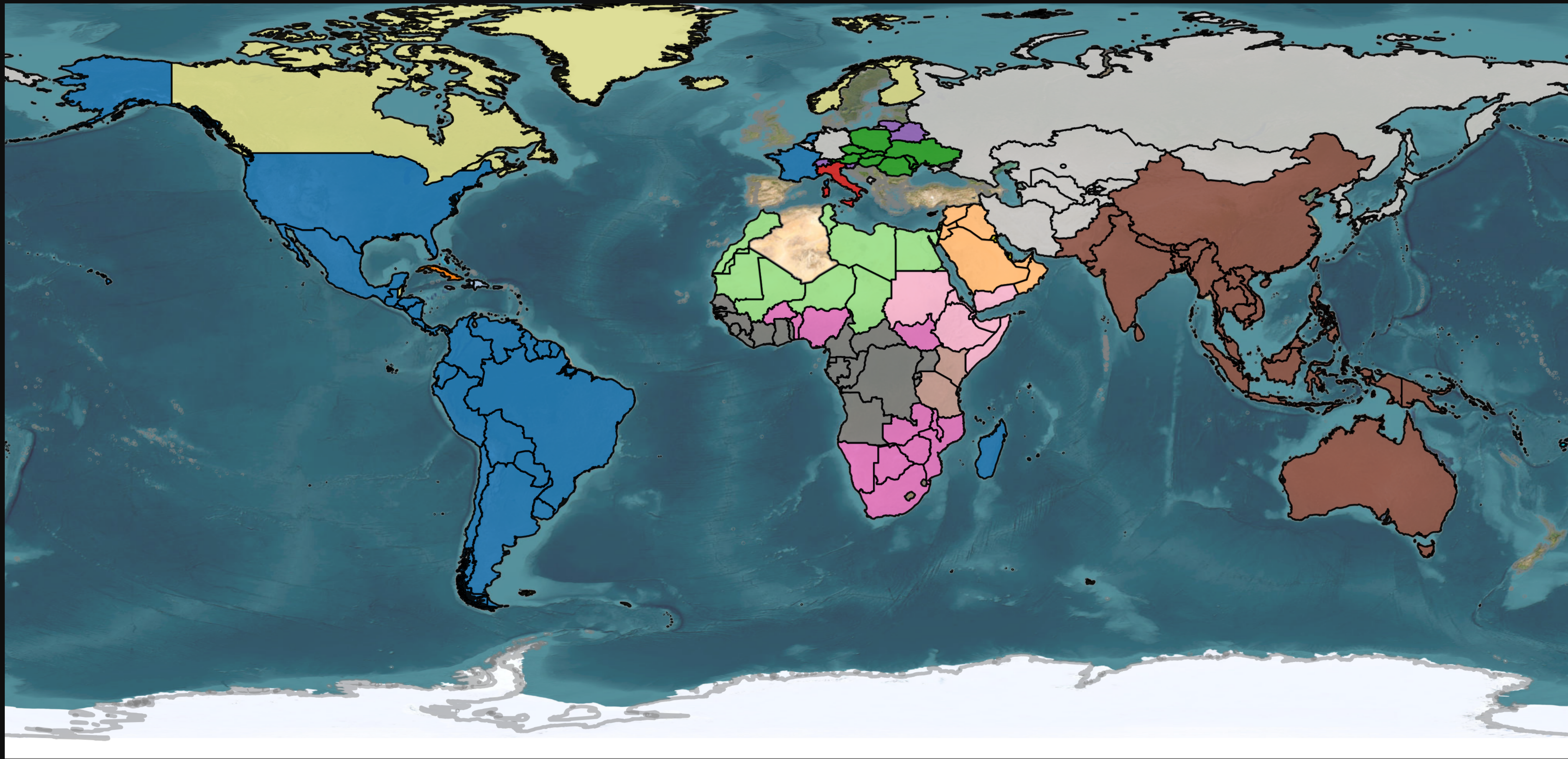
[Amazing species](#)

More than 42,100 species
are threatened with extinction











Livable cities, urban networks, ChatGPT

The EIU's Global Liveability Ranking

Main article: [Global Liveability Ranking](#)

The [Economist Intelligence Unit's](#) (EIU) publishes an annual assessments of their stability, [healthcare](#), culture, environment. [Melbourne](#), Australia, had been ranked by the EIU as the [Vancouver](#), Canada, was ranked the EIU's most livable city since 2015, while [Vienna](#), Austria, ranked second until 2011. The Syrian capital, [Damascus](#), was ranked the least livable. The EIU also publishes a Worldwide Cost of Living Survey.

	City	Country/Region
1	Vienna	Austria
2	Copenhagen	Denmark
3	Zurich	Switzerland
4	Calgary	Canada
5	Vancouver	Canada
6	Geneva	Switzerland
7	Frankfurt	Germany
8	Toronto	Canada
9	Amsterdam	Netherlands
10	Melbourne	Australia
11	Osaka	Japan

Monocle's Quality of Life Survey

Since 2006, the lifestyle magazine [Monocle](#) has presented 20 top locations for [quality of life](#).

Important criteria in this survey are safety/crime, infrastructure, environmental issues and access to nature, urban environment.

The 2022 Monocle Survey determined the world's

	City	Country/Region
1	Copenhagen	Denmark
2	Zürich	Switzerland
3	Lisbon	Portugal
4	Helsinki	Finland
5	Stockholm	Sweden
6	Tokyo	Japan
7	Vienna	Austria
8	Sydney	Australia
9	Vancouver	Canada
10	Taipei	Taiwan
11	Munich	Germany
12	Seoul	South Korea
13	Berlin	Germany
14	Amsterdam	Netherlands
15	Madrid	Spain
16	Auckland	New Zealand
17	Paris	France
18	Barcelona	Spain
19	Melbourne	Australia

Global Finance's World's Best Cities

[Global Finance](#) is an English-language monthly financial magazine presenting a comprehensive list of eight unique factors. These are: safety; accessibility; GDP per capita (nominal in U.S. dollars);

	City	Country/Region
1	London	United Kingdom
2	Tokyo	Japan
3	Shanghai	China
4	Singapore	Singapore
5	Melbourne	Australia
6	Sydney	Australia
7	Paris	France
8	Beijing	China
9	New York	United States
10	Amsterdam	Netherlands

Deutsche Bank Liveability Survey

The 2019 survey showed the following cities to be the

	City	Country/Region
1	Zürich	Switzerland
2	Wellington	New Zealand
3	Copenhagen	Denmark
4	Edinburgh	United Kingdom
5	Vienna	Austria
6	Helsinki	Finland
7	Melbourne	Australia
8	Boston	United States
9	San Francisco	United States
10	Sydney	Australia

Mercer's Quality of Living Ranking

American global [human resources](#) and related financial magazine publishes a list of 221 cities based on 39 criteria. New York City is given [education](#), [hygiene](#), [health care](#), [culture](#), [environment](#), intended to help [multinational companies](#) decide where to live. [Vienna](#) first in its annual "Quality of Living" survey since 2003.

	City	Country/Region
1	Vienna	Austria
2	Zürich	Switzerland
3	Vancouver	Canada
4	Munich	Germany
5	Auckland	New Zealand
6	Düsseldorf	Germany
7	Frankfurt	Germany
8	Copenhagen	Denmark
9	Geneva	Switzerland
10	Basel	Switzerland
11	Sydney	Australia
12	Amsterdam	Netherlands

Numbeo's Quality of Life Ranking

[Numbeo](#) is a [crowd-sourced](#) global database of reports

	City	Country/Region
1	Adelaide	Australia
2	Canberra	Australia
3	Wellington	New Zealand
4	Raleigh, North Carolina	United States
5	Zürich	Switzerland
6	The Hague	Netherlands
7	Madison, Wisconsin	United States
8	Columbus, Ohio	United States
9	Austin, Texas	United States
10	Brisbane	Australia
11	Eindhoven	Netherlands
12	Victoria, British Columbia	Canada
13	Charlotte, North Carolina	United States
14	Vienna	Austria
15	Geneva	Switzerland

me:

Give me please a color palette of 12 pairs of colors which include the pairs of CherryRed and OffWhite, Coral and Yellow, and BubblegumPink and CherryRed when the colors are ordered based on the primary colors.

chatbot:

Sure, here is a color palette of 12 pairs of colors that include the pairs of Cherry Red and Off White, Coral and Yellow, and Bubblegum Pink and Cherry Red, ordered based on the primary colors:

Cherry Red (#ff0000) and Off White (#f5f5f5)

Coral (#ff7f50) and Yellow (#ffff00)

bubblegum Pink (#ffc0cb) and Cherry Red (#ff0000)

Red-Orange (#ff4500) and Lime Green (#32cd32)

Orange (#ffa500) and Green (#00ff00)

Lime Green (#32cd32) and Turquoise (#40e0d0)

Green (#00ff00) and Blue (#0000ff)

Turquoise (#40e0d0) and Purple (#6600ff)

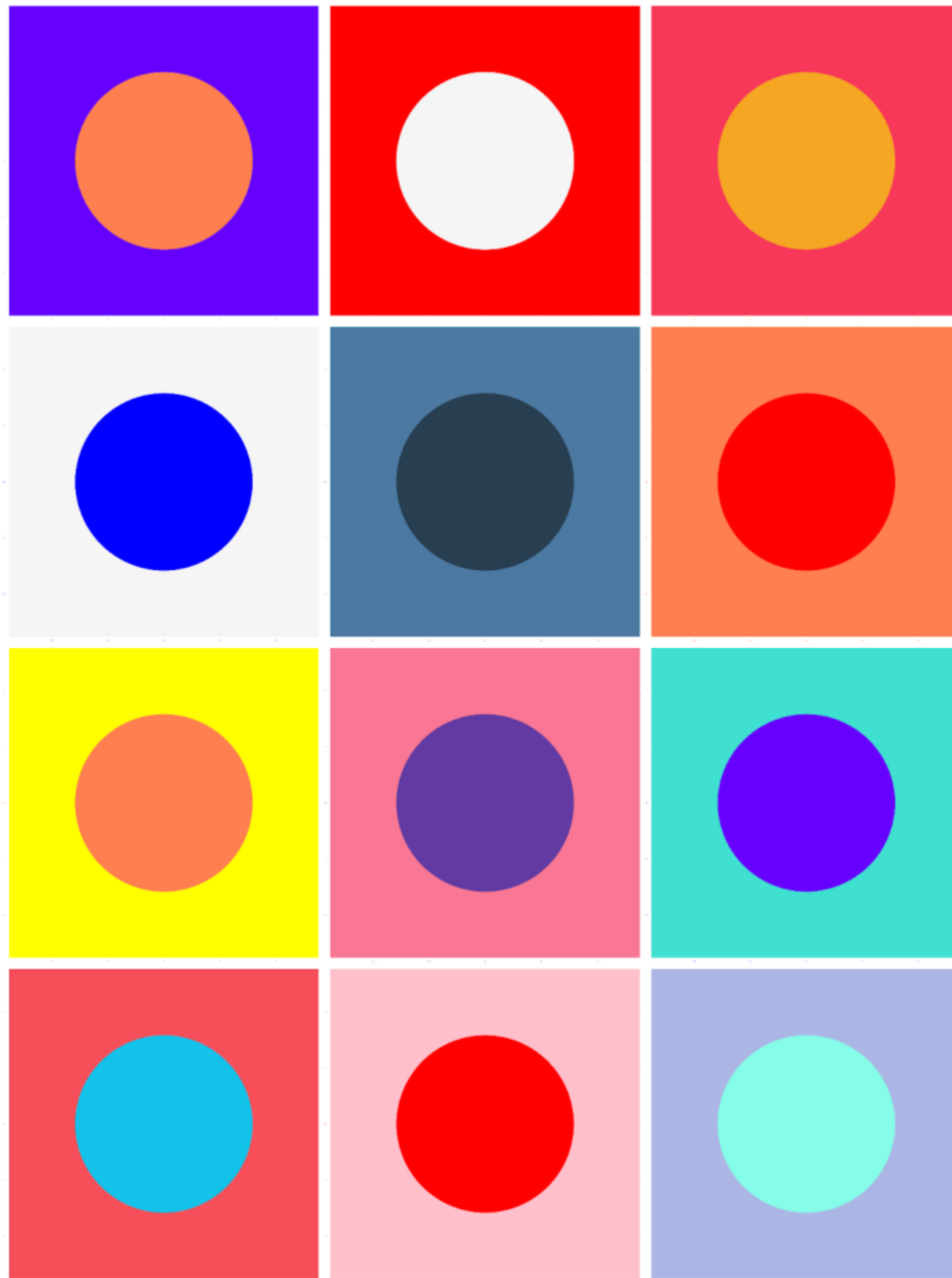
Blue (#0000ff) and Off White (#f5f5f5)

Purple (#6600ff) and Coral (#ff7f50)

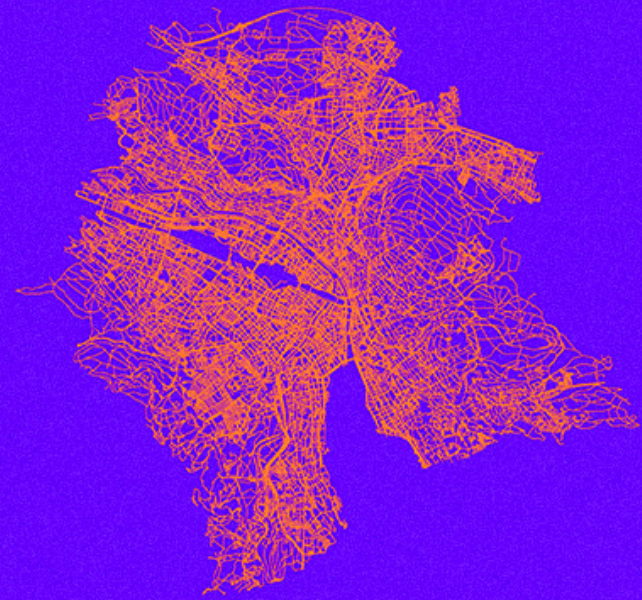
Off White (#f5f5f5) and bubblegum Pink (#ffc0cb)

Coral (#ff7f50) and Cherry Red (#ff0000)

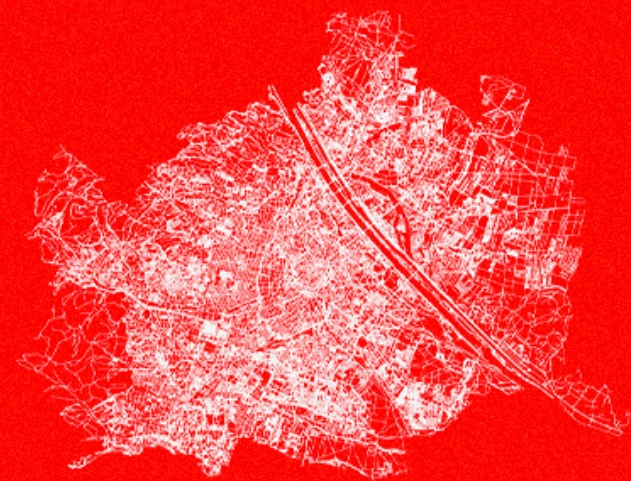
As a reminder, keep in mind that color palettes often depend on the context, the purpose, and the medium where you will use them. Also, this ordering is based on the traditional primary colors but it is not always the case, some palettes could be organize differently.



ZURICH
SWITZERLAND



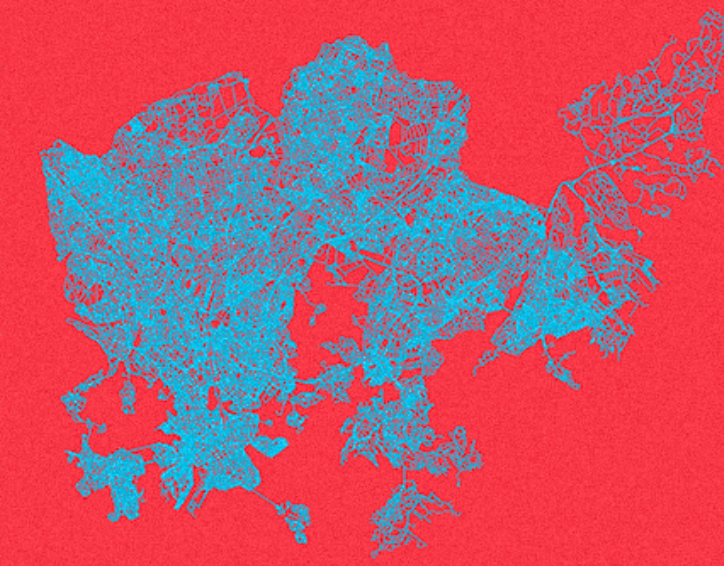
VIENNA
AUSTRIA



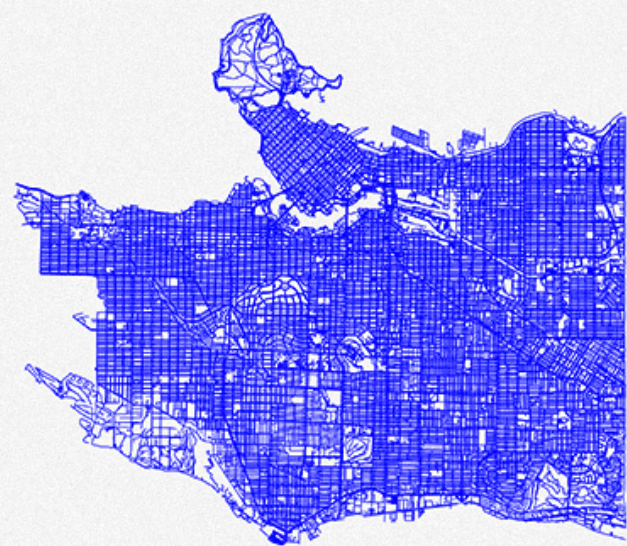
COPENHAGEN
DENMARK



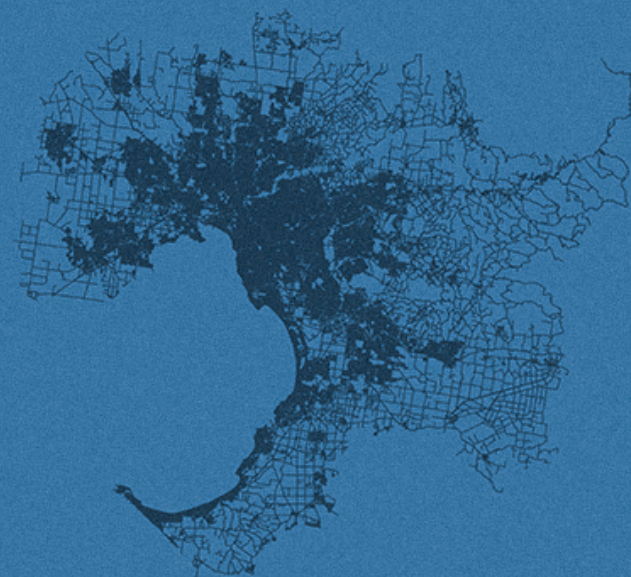
HELSINKI
FINLAND



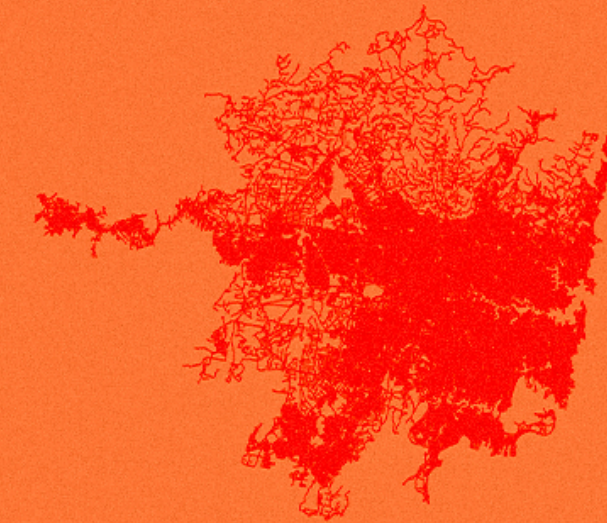
VANCOUVER
CANADA



MELBOURNE
AUSTRALIA



SYDNEY
AUSTRALIA



TOKYO
JAPAN



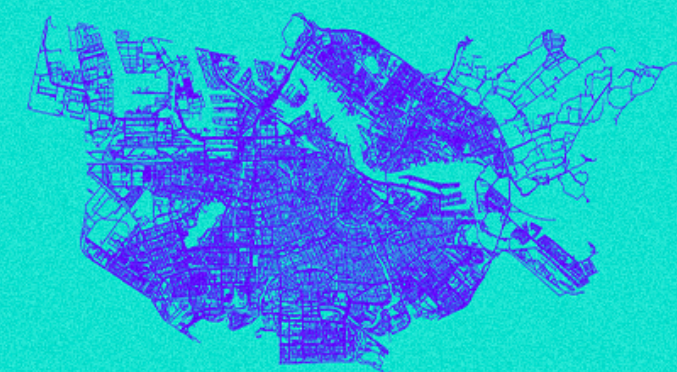
GENEVA
SWITZERLAND



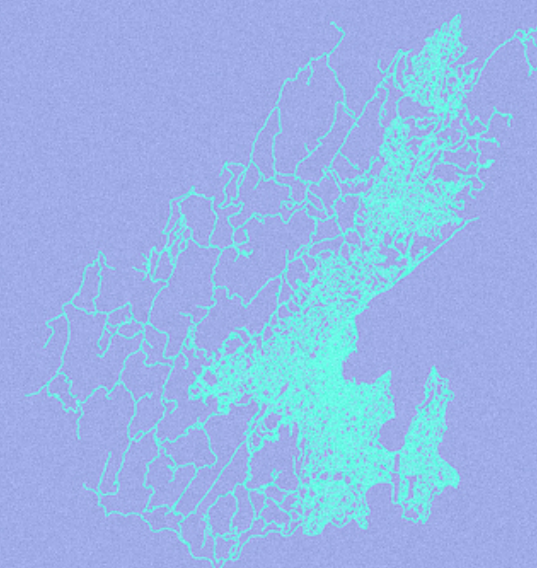
FRANKFURT
GERMANY



AMSTERDAM
NETHERLANDS



WELLINGTON
NEW ZEALAND






Assessing bikeability

[Back to web results for mol bubi](#)

MOL Bubi
Budapest, Hungary

 **DIRECTIONS**

MOL Bubi
Budapest, Hungary

 **DIRECTIONS**

MOL Bubi
Budapest, Hungary

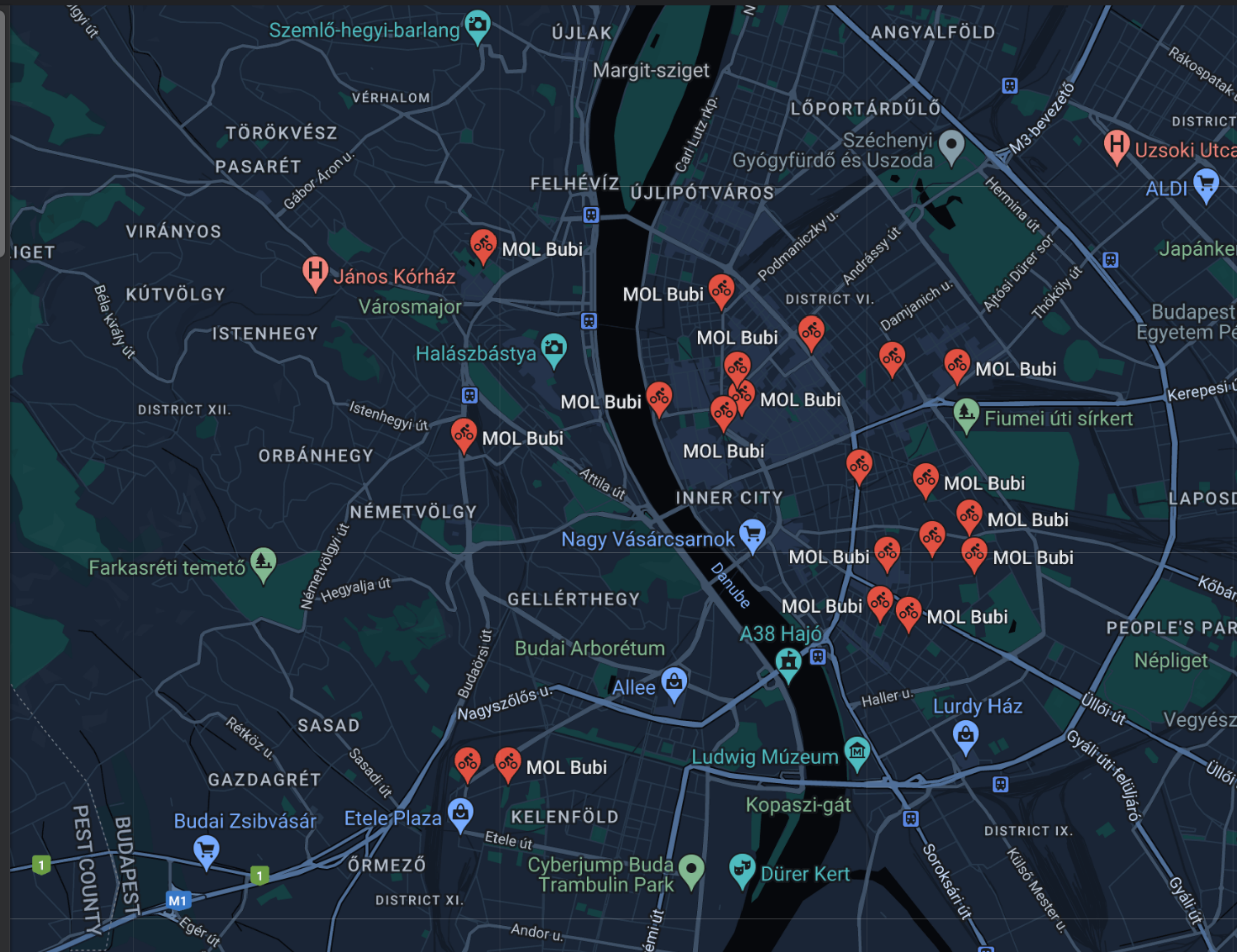
 **DIRECTIONS**

MOL Bubi
Budapest, Hungary

 **DIRECTIONS**

MOL Bubi
Budapest, Hungary

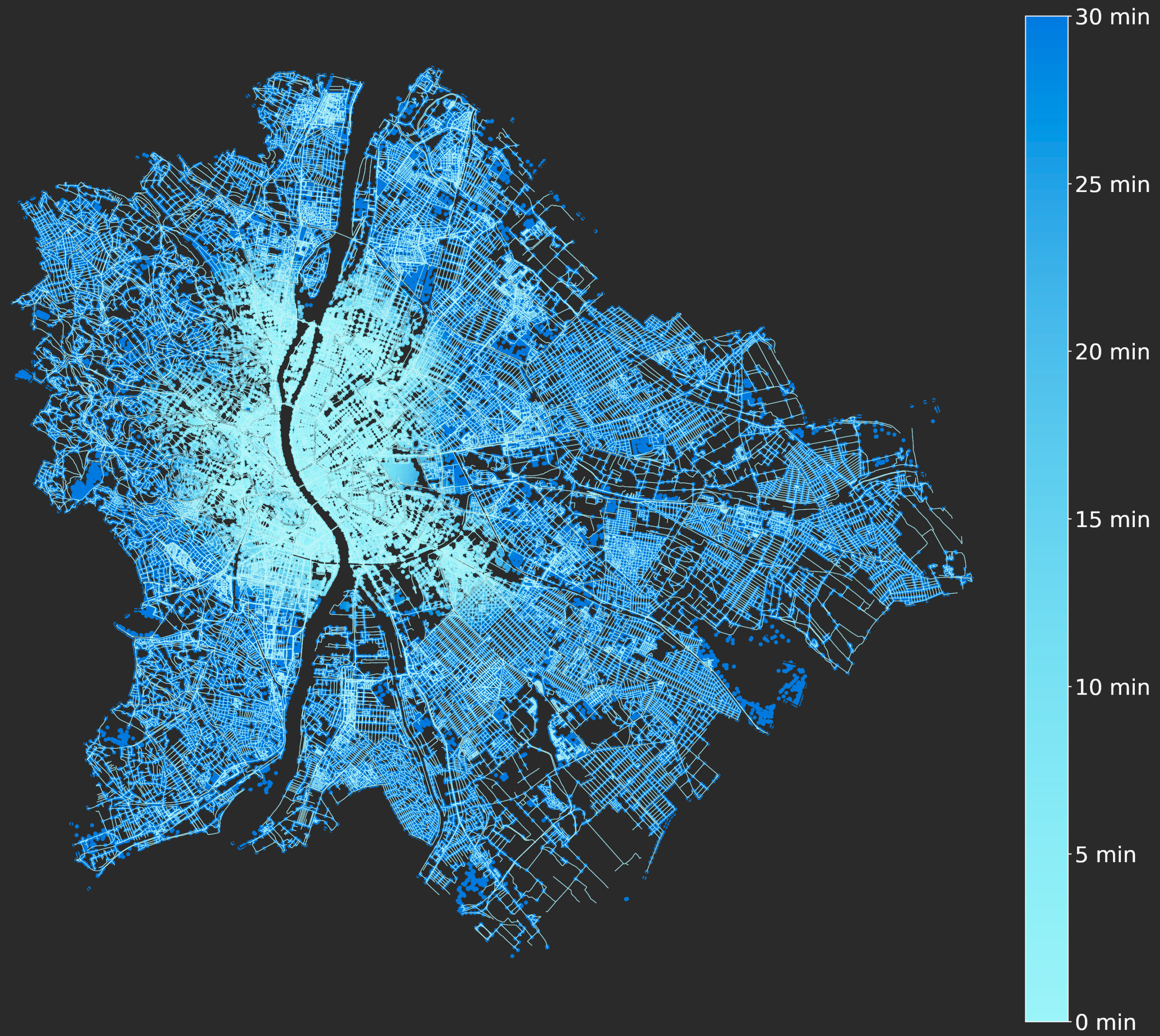
 **DIRECTIONS**



161 stations

750 km bike paths

99 km dedicated bike road



43 % of the nghs **30 min** to bubu
22 % of the nghs **15 min** to bubu

FIFA World Cup 2022 – The Network Edition

Milán Janosov & Patrik Szigeti • December 23, 2022



CLUBS STARTING INTO TOURNAMENT AT A LATER POINT

Club	Squad	⚭-Age	WC particip.	Foreigners	Market Value	⚭-Market Value
 England	26	24.2	16	3.8 %	€1.28bn	€49.23m
 Brazil	25	25.4	22	88.0 %	€1.15bn	€45.84m
 France	22	24.9	16	86.4 %	€1.01bn	€45.91m
 Germany	26	24.7	20	23.1 %	€890.50m	€34.25m
 Spain	25	23.8	16	32.0 %	€872.00m	€34.88m
 Portugal	24	25.4	8	70.8 %	€871.00m	€36.29m
 Argentina	26	25.5	18	96.2 %	€710.20m	€27.32m
 Netherlands	26	24.9	11	61.5 %	€605.25m	€23.28m
 Belgium	25	25.4	14	80.0 %	€555.70m	€22.23m
 Uruguay	25	25.3	14	96.0 %	€449.00m	€17.96m
 Croatia	26	25.0	6	84.6 %	€400.00m	€15.38m
 Denmark	26	25.0	6	92.3 %	€353.00m	€13.58m
 Morocco	26	24.8	6	88.5 %	€291.10m	€11.20m
 Switzerland	26	24.9	12	80.8 %	€281.00m	€10.81m
 Poland	26	24.9	9	88.5 %	€257.60m	€9.91m
 Canada	26	24.7	2	73.1 %	€187.20m	€7.20m
 Mexico	26	24.3	17	46.2 %	€177.60m	€6.83m
 Japan	26	24.8	7	80.8 %	€166.80m	€6.42m
 South Korea	26	24.6	11	46.2 %	€165.63m	€6.37m
 Wales	25	24.1	2	84.0 %	€158.15m	€6.33m
 Ecuador	26	23.3	4	84.6 %	€151.50m	€5.83m
 United States	24	22.6	11	41.7 %	€75.88m	€3.16m
 Tunisia	26	25.2	6	69.2 %	€59.75m	€2.30m
 Iran	25	26.2	6	64.0 %	€59.53m	€2.38m
 Australia	26	25.5	6	69.2 %	€39.20m	€1.51m
 Serbia	17	24.5	3	23.5 %	€21.30m	€1.25m
 Costa Rica	25	24.6	6	48.0 %	€18.60m	€744k
 Qatar	23	24.6	1	%	€6.30m	€274k
 Saudi Arabia	23	25.1	6	%	€5.60m	€243k
 Ghana	27	23.4	4	7.4 %	€2.68m	€99k
 Senegal	24	24.5	3	20.8 %	€450k	€19k
 Cameroon	25	24.6	8	4.0 %	€300k	€12k

CLUBS STARTING INTO TOURNAMENT AT A LATER POINT

Club	Squad	⌀-Age	WC particip.	Foreigners
England	26	24.2	16	3.8 %
Brazil	25	25.4	22	88.0 %
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Netherlands	26	24.9	11	61.5 %
Belgium	25	25.4	14	80.0 %
Uruguay	25	25.3	14	96.0 %
Croatia	26	25.0	6	84.6 %
Denmark	26	25.0	6	92.3 %
Morocco	26	24.8	6	88.5 %
Switzerland	26	24.9	12	80.8 %
Poland	26	24.8	8	88.5 %
Canada	26	24.8	8	73.1 %
Mexico	26	24.8	8	46.2 %
Japan	26	24.8	7	80.8 %
South Korea	26	24.6	11	46.2 %
Wales	25	24.1	2	84.0 %
Ecuador	26	23.3	4	84.6 %
United States	24	22.6	11	41.7 %
Tunisia	26	25.2	6	69.2 %
Iran	25	26.2	6	64.0 %
Australia	26	25.5	6	69.2 %
Serbia	17	24.5	3	23.5 %
Costa Rica	25	24.6	6	48.0 %
Qatar	23	24.6	1	%
Saudi Arabia	23	25.1	6	%
Ghana	27	23.4	4	7.4 %
Senegal	24	24.5	3	20.8 %
Cameroon	25	24.6	8	4.0 %

Teams

SQUAD OF FRANCE

Choose year:

Compact Detailed Gallery

# ↑	Player ↓	Age ↑	Club	Market value ↓
23	Alphonse Areola Goalkeeper	29		€8.00m
5	Jules Kounde Centre-Back	24		€60.00m
18	Dayot Upamecano Centre-Back	24		€60.00m
17	William Saliba Centre-Back	21		€50.00m
21	Lucas Hernández 🇨🇭 Centre-Back	27		€50.00m
24	Ibrahima Konaté Centre-Back	23		€35.00m
3	Axel Disasi Centre-Back	24		€25.00m
22	Theo Hernández Left-Back	25		€60.00m
2	Benjamin Pavard 🇵🇷 Right-Back	26		€35.00m
8	Aurélien Tchouameni Defensive Midfield	23		€90.00m
15	Jordan Veretout Defensive Midfield	29		€14.00m
25	Eduardo Camavinga Central Midfield	20		€50.00m
6	Mattéo Guendouzi Central Midfield	23		€25.00m
13	Youssef Fofana Central Midfield	24		€25.00m
14	Adrien Rabiot Central Midfield	27		€25.00m
11	Ousmane Dembélé 🇨🇭 Right Winger	25		€60.00m
20	Kingsley Coman Right Winger	26		€60.00m
7	Antoine Griezmann Second Striker	31		€25.00m
10	Kylian Mbappé Centre-Forward	24		€180.00m

CLUBS STARTING INTO TOURNAMENT AT A LATER POINT

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England	26	24.2	16	3.8 %
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Switzerland	26	24.9	12	80.8 %
Poland	26	24.8	8	88.5 %
Canada	26	24.8	8	73.1 %
Mexico	26	24.8	8	46.2 %
Japan	26	24.8	7	80.8 %
South Korea	26	24.6	11	46.2 %
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Iran	25	26.2	6	64.0 %
Australia	26	25.5	6	69.2 %
Serbia	17	24.5	3	23.5 %
Costa Rica	25	24.6	6	48.0 %
Qatar	23	24.6	1	%
Saudi Arabia	23	25.1	6	%
Ghana	27	23.4	4	7.4 %
Senegal	24	24.5	3	20.8 %
Cameroon	25	24.6	8	4.0 %

Teams

SQUAD OF FRANCE

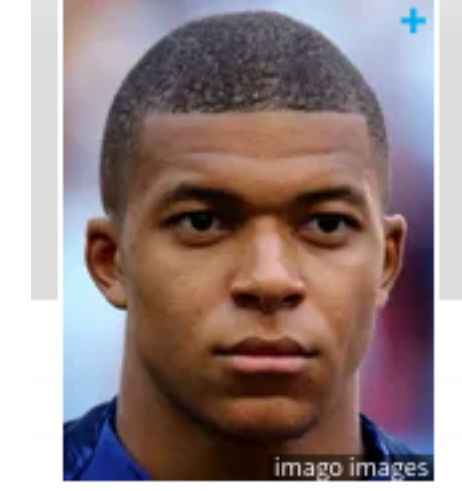
Choose year: 2023 Show

Compact Detailed Gallery

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13	Youssef Fofana Central Midfield	24	PSG	€25.00m
14	Adrien Rabiot Central Midfield	27	PSG	€25.00m
11	Ousmane Dembélé Right Winger	25	PSG	€60.00m
20	Kingsley Coman Right Winger	26	PSG	€60.00m
7	Antoine Griezmann Second Striker	31	PSG	€25.00m
10	Kylian Mbappé Centre-Forward	24	PSG	€180.00m

Players

#7 Kylian Mbappé



1 9 1 5 1 >>

Date of birth/Age: Dec 20, 1998 (24) Height: 1,78 m Current international: France
 Place of birth: Bondy Position: Centre-Forward Caps/Goals: 66 / 36
 Citizenship: France

DATA SCOUTS WANTED

PROFILE STATS MARKET VALUE TRANSFERS RUMOURS NATIONAL TEAM NEWS ACHIEVEMENTS CAREER

TRANSFER HISTORY

Season	Date	Left	Joined	MV	Fee
18/19	Jul 1, 2018	Monaco	Paris SG	€120.00m	€180.00m
17/18	Jun 30, 2018	Paris SG	Monaco	€120.00m	End of loan
17/18	Aug 31, 2017	Monaco	Paris SG	€35.00m	loan transfer
15/16	Dec 1, 2015	Monaco U19	Monaco	-	-
15/16	Jul 1, 2015	Monaco Youth	Monaco U19	-	-
13/14	Jul 1, 2013	Clairef. Yth.	Monaco Youth	-	free transfer
11/12	Jul 1, 2011	AS Bondy Youth	Clairef. Yth.	-	free transfer

Total transfer fees: €180.00m

CLUBS STARTING INTO TOURNAMENT AT A LATER POINT

Club	Squad	Age	WC particip.	Foreigners
England	26	24.2	16	3.8 %
Brazil	25	25.4	22	88.0 %
France	22	24.9	16	86.4 %
Germany	26	24.7	20	23.1 %
Spain	25	23.8	16	32.0 %
Portugal	24	25.4	8	70.8 %
Argentina	26	25.5	18	96.2 %
Netherlands	26	24.9	11	61.5 %
Belgium	25	25.4	14	80.0 %
Uruguay	25	25.3	14	96.0 %
Croatia	26	25.0	6	84.6 %
Denmark	26	25.0	6	92.3 %
Morocco	26	24.8	6	88.5 %
Switzerland	26	24.9	12	80.8 %
Poland	26	24.8	8	88.5 %
Canada	26	24.8	8	73.1 %
Mexico	26	24.8	8	46.2 %
Japan	26	24.8	7	80.8 %
South Korea	26	24.6	11	46.2 %
Wales	25	24.1	2	84.0 %
Ecuador	26	23.3	4	84.6 %
United States	24	22.6	11	41.7 %
Tunisia	26	25.2	6	69.2 %
Iran	25	26.2	6	64.0 %
Australia	26	25.5	6	69.2 %
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Costa Rica	25	24.6	6	48.0 %
Qatar	23	24.6	1	%
Saudi Arabia	23	25.1	6	%
Ghana	27	23.4	4	7.4 %
Senegal	24	24.5	3	20.8 %
Cameroon	25	24.6	8	4.0 %

Teams

SQUAD OF FRANCE

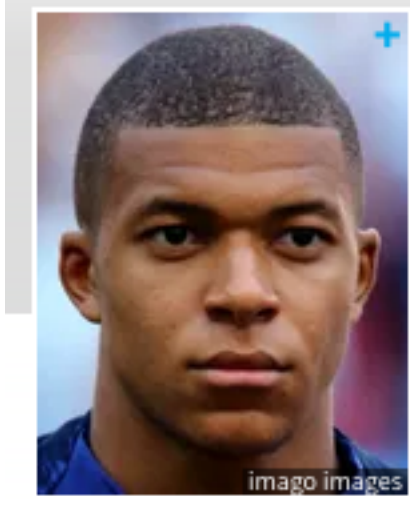
Choose year: 2023 Show

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Players

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DATA SCOUTS WANTED: Transfers

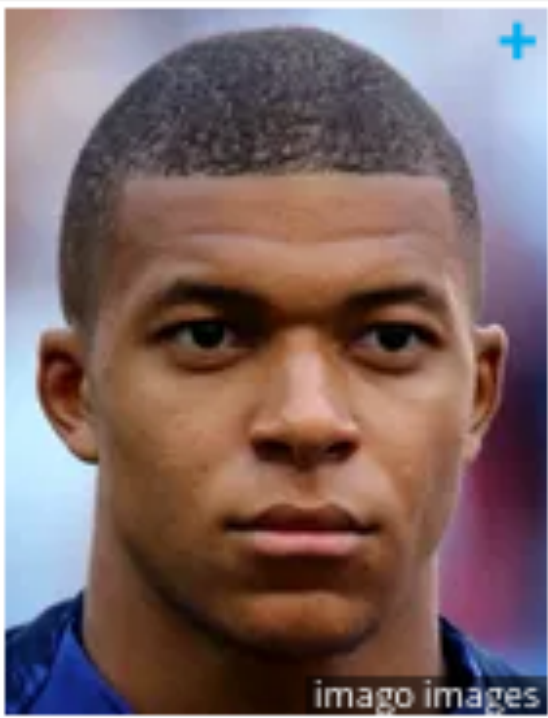
TRANSFER HISTORY

Season	Date	Left	Joined	MV	Fee
18/19	Jul 1, 2018	Monaco	Paris SG	€120.00m	€180.00m
17/18	Jun 30, 2018	Paris SG	Monaco	€120.00m	End of loan
17/18	Aug 31, 2017	Monaco	Paris SG	€35.00m	loan transfer
15/16	Dec 1, 2015	Monaco U19	Monaco	-	-
15/16	Jul 1, 2015	Monaco Youth	Monaco U19	-	-
13/14	Jul 1, 2013	Clairef. Yth.	Monaco Youth	-	free transfer
11/12	Jul 1, 2011	AS Bondy Youth	Clairef. Yth.	-	free transfer

Total transfer fees: €180.00m

Network of clubs

#7 Kylian Mbappé

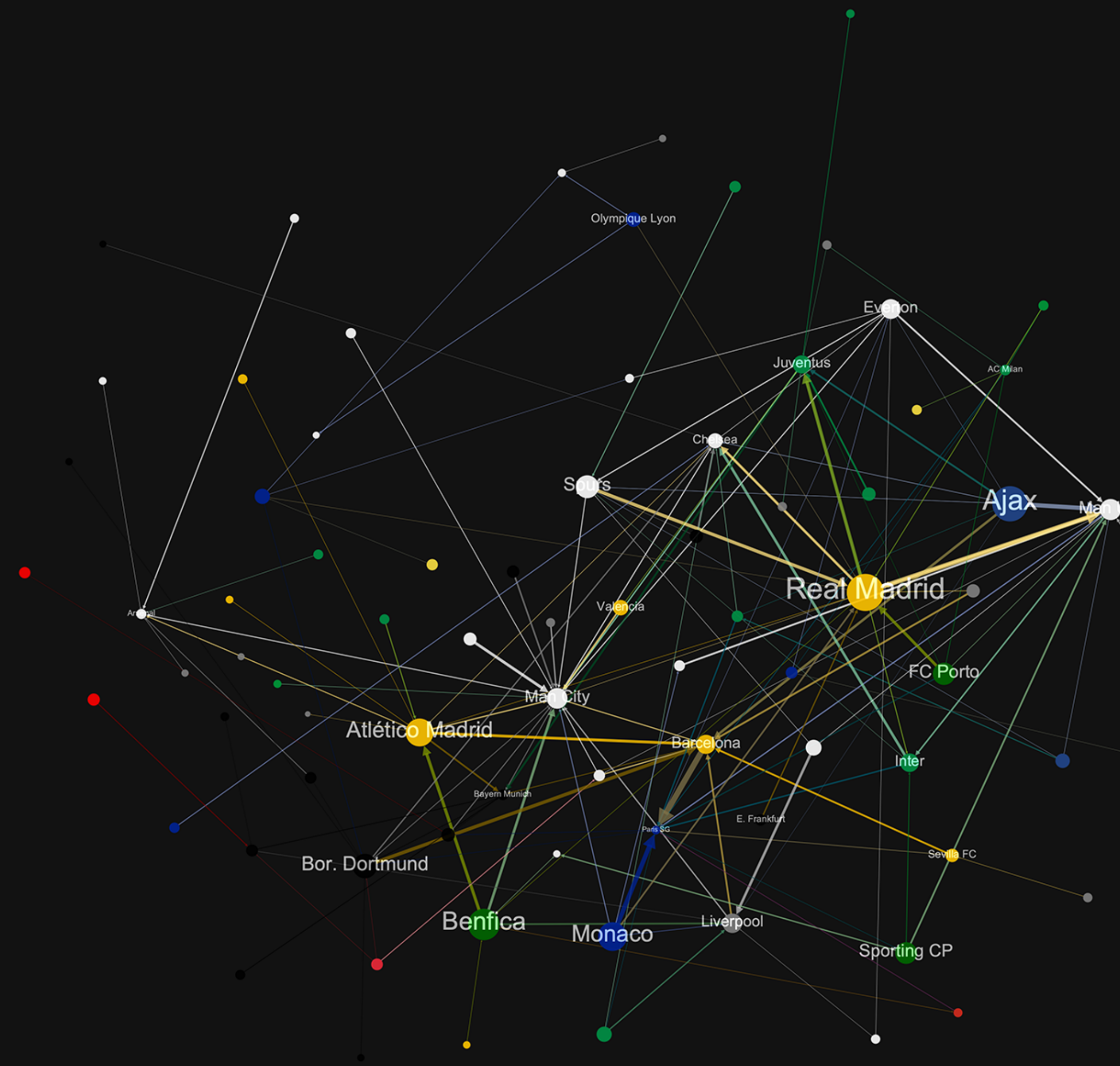
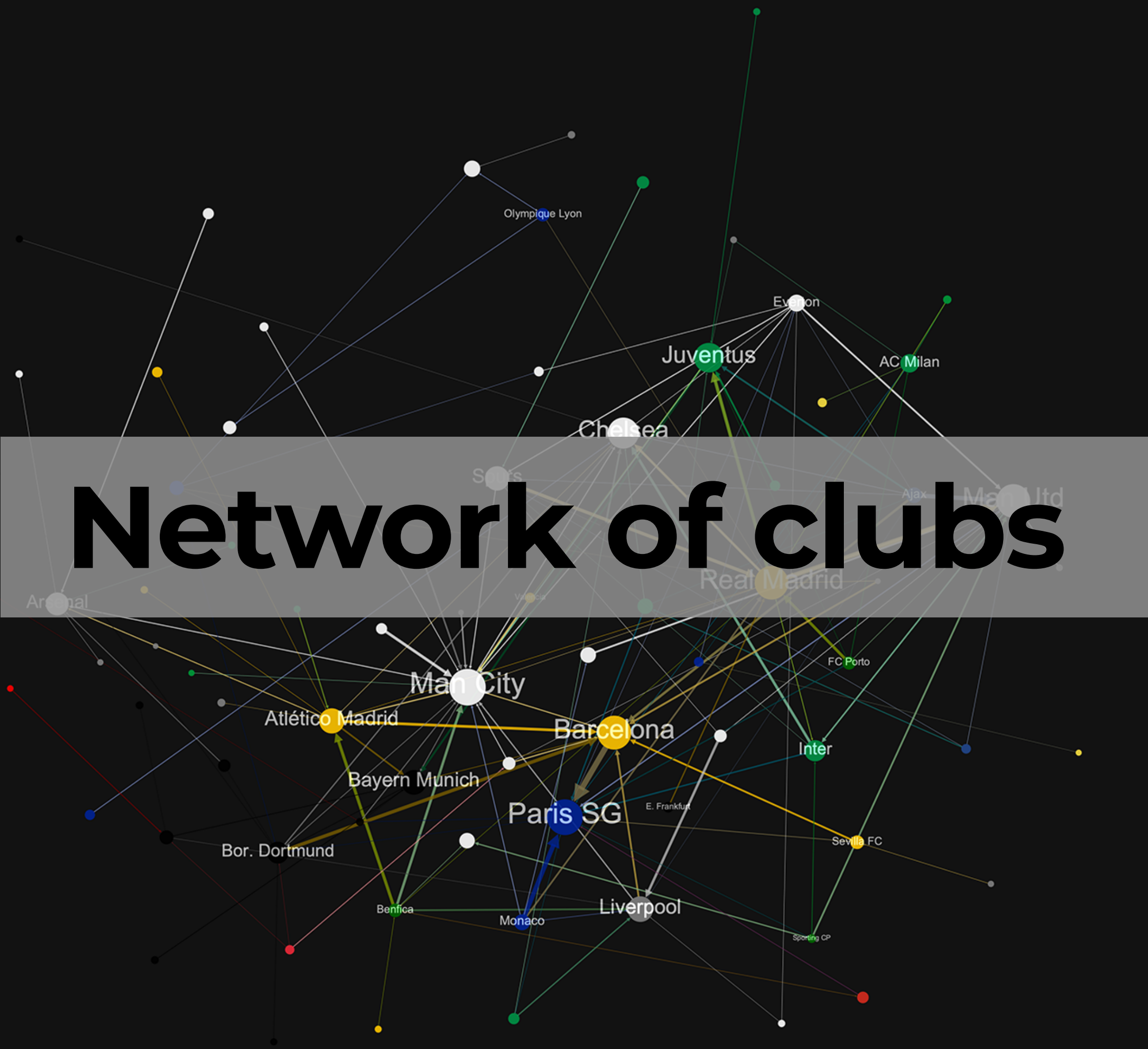


1
 9
 1
 5
 1
 >>

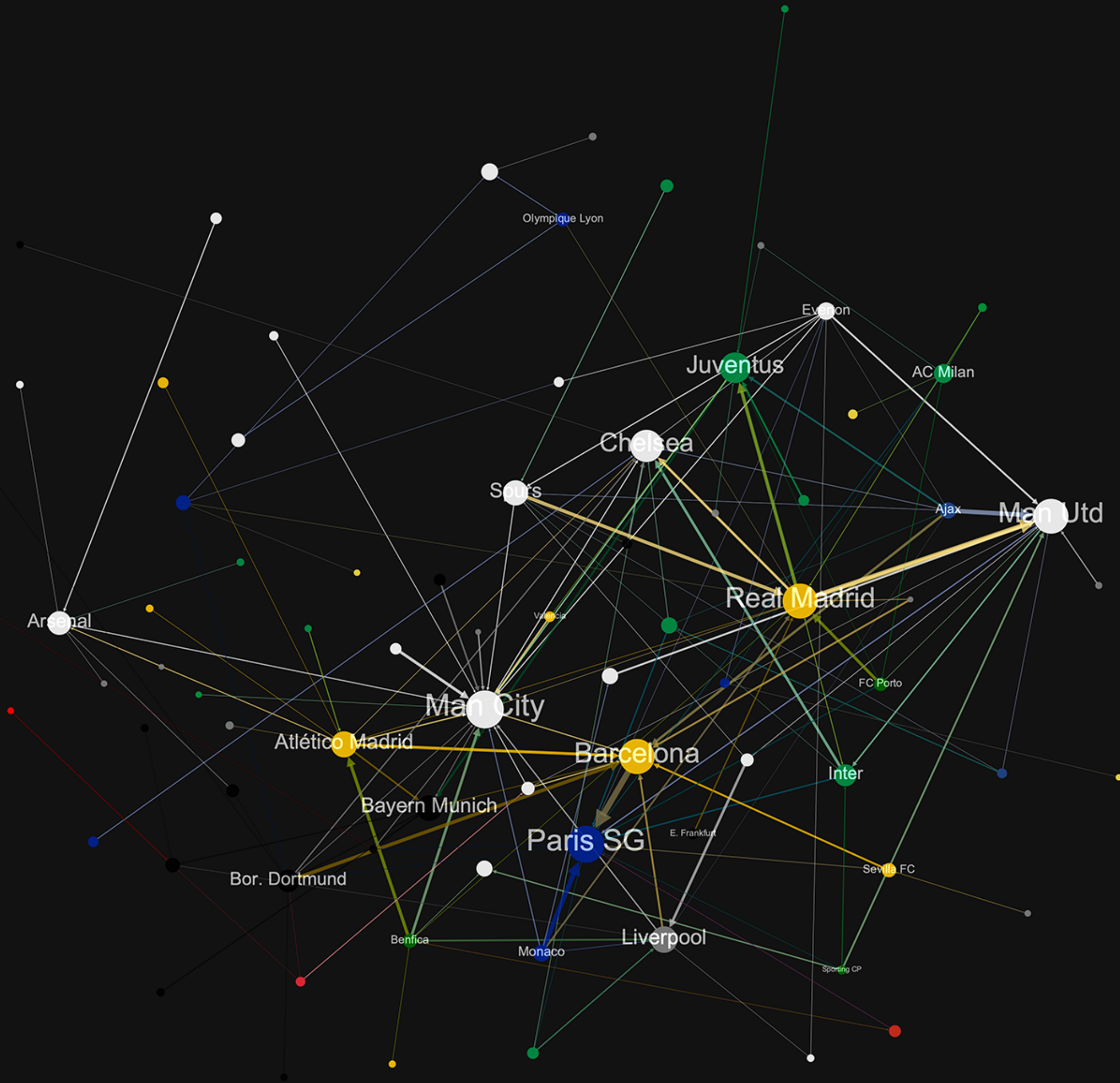
Date of birth/Age: Dec 20, 1998 (24) Height: 1,78 m Current international: France
 Place of birth: Bondy Position: Centre-Forward Caps/Goals: 66 / 36
 Citizenship: France

TRANSFER HISTORY					
Season	Date	Left	Joined	MV	Fee
18/19	Jul 1, 2018	Monaco	Paris SG	€120.00m	€180.00m >
17/18	Jun 30, 2017	Paris SG	Monaco	€120.00m	End of loan >
17/18	Jul 1, 2017	Monaco	Paris SG	€35.00m	loan transfer >
15/16	Jul 1, 2015	Monaco U19	Monaco	-	- >
15/16	Jul 1, 2015	Monaco Youth	Monaco U19	-	- >
13/14	Jul 1, 2013	Clairef. Yth.	Monaco Youth	-	free transfer >
11/12	Jul 1, 2011	AS Bondy Youth	Clairef. Yth.	-	free transfer >
Total transfer fees:					€180.00m

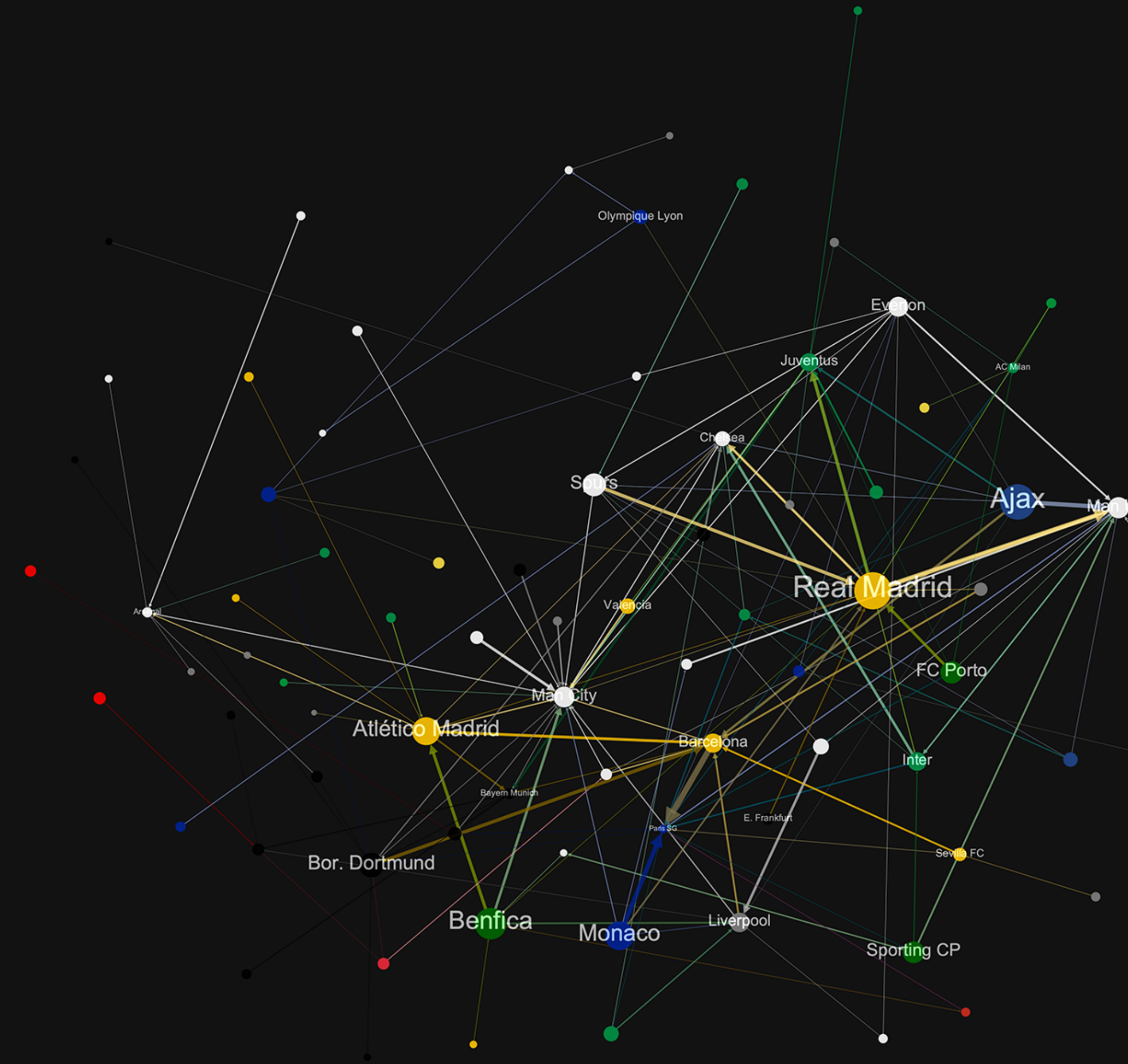
Network of clubs

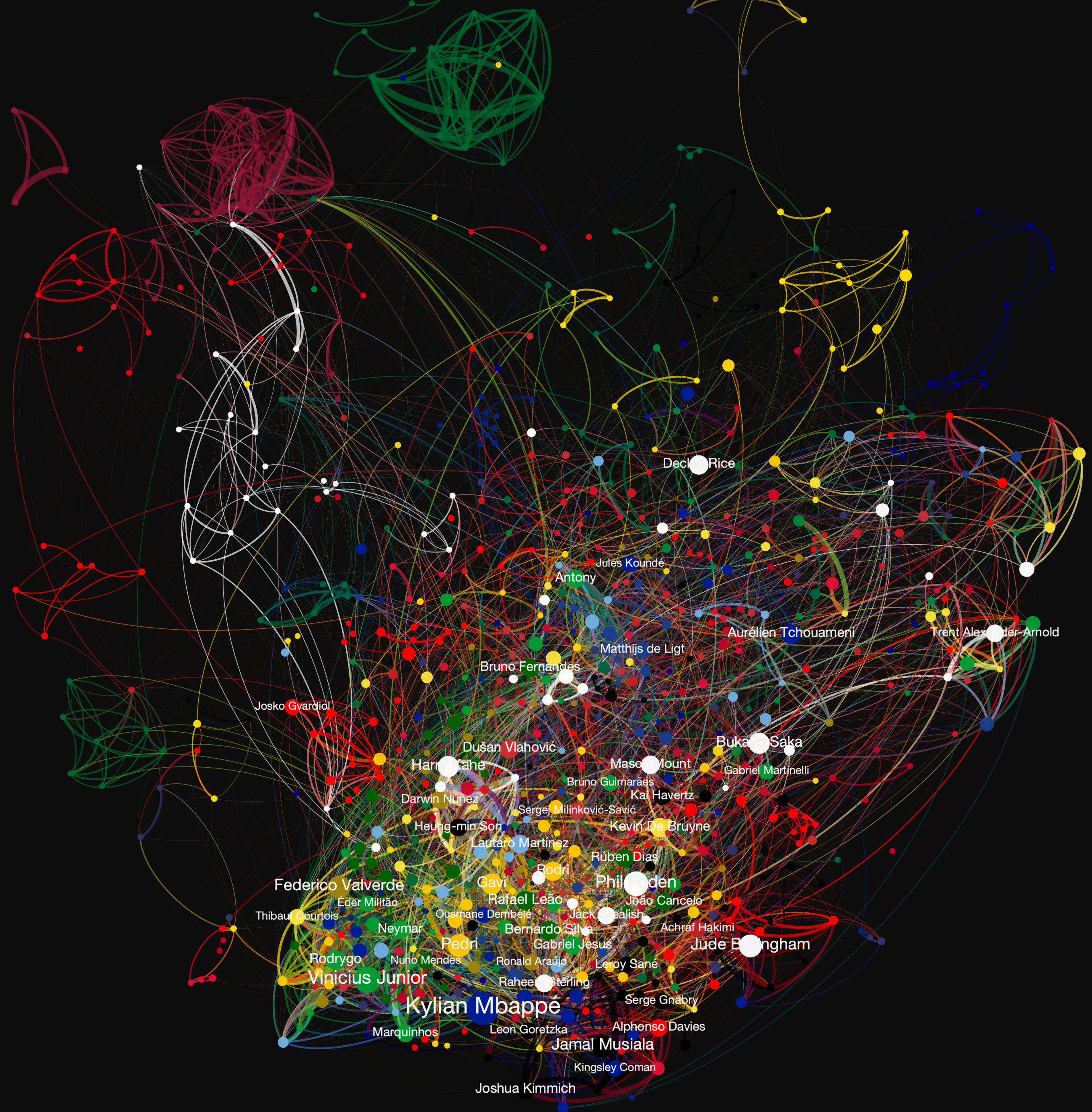


Spenders



Mentors





Player toplists

Id	current_market_value
Kylian Mbappé	160000000.0
Vinicius Junior	120000000.0
Federico Valverde	100000000.0
Jamal Musiala	100000000.0
Jude Bellingham	100000000.0
Pedri	90000000.0
Harry Kane	90000000.0
Rafael Leão	85000000.0
Rodrygo	80000000.0
Bernardo Silva	80000000.0

Id	first_market_value
Lucas Hernández	70000000.0
Cristiano Ronaldo	60000000.0
Eduardo Camavinga	55000000.0
Kalvin Phillips	50000000.0
Neymar	50000000.0
Christian Pulisic	50000000.0
Julian Brandt	50000000.0
Rodrygo	40000000.0
Raheem Sterling	40000000.0
Nuno Mendes	40000000.0

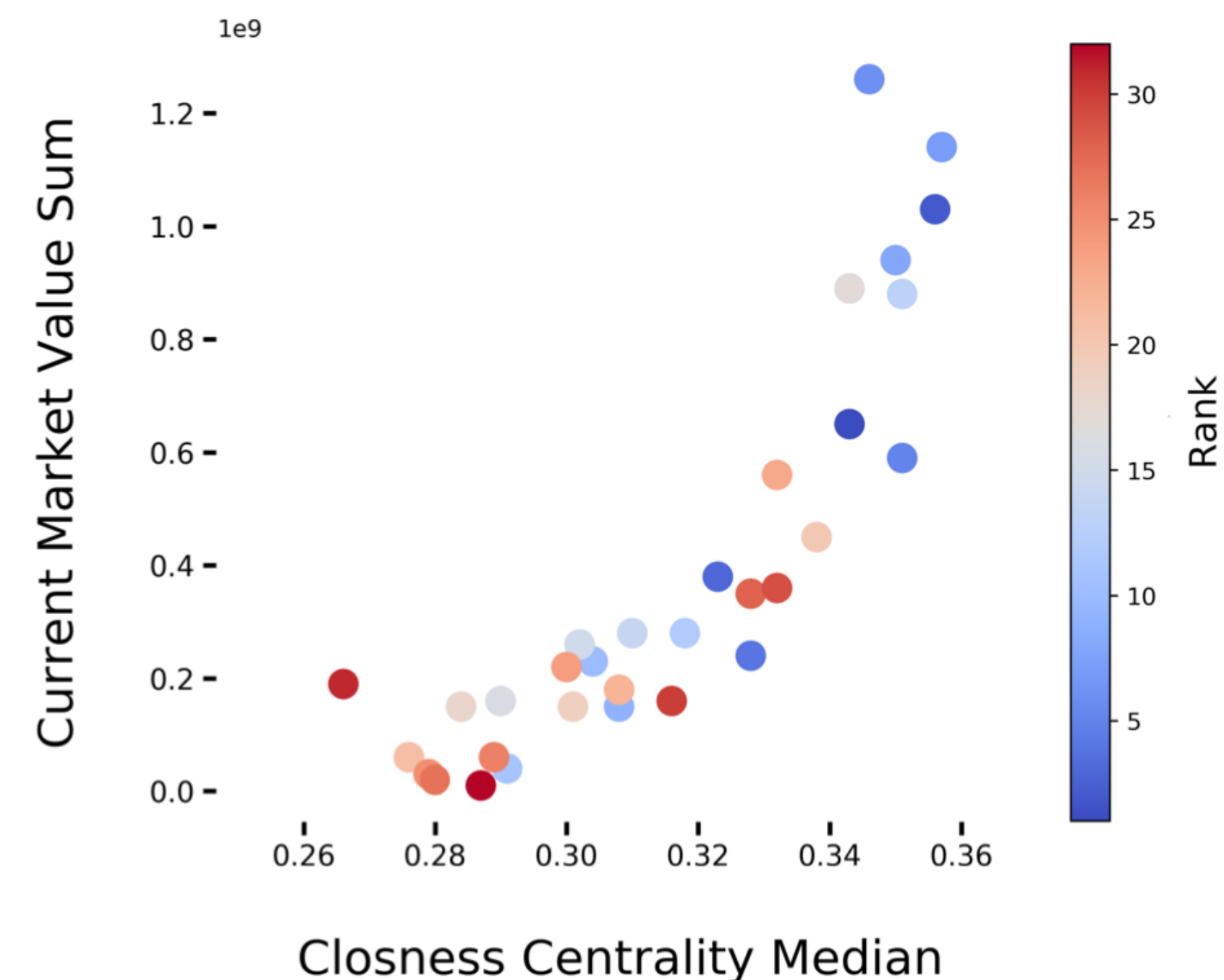
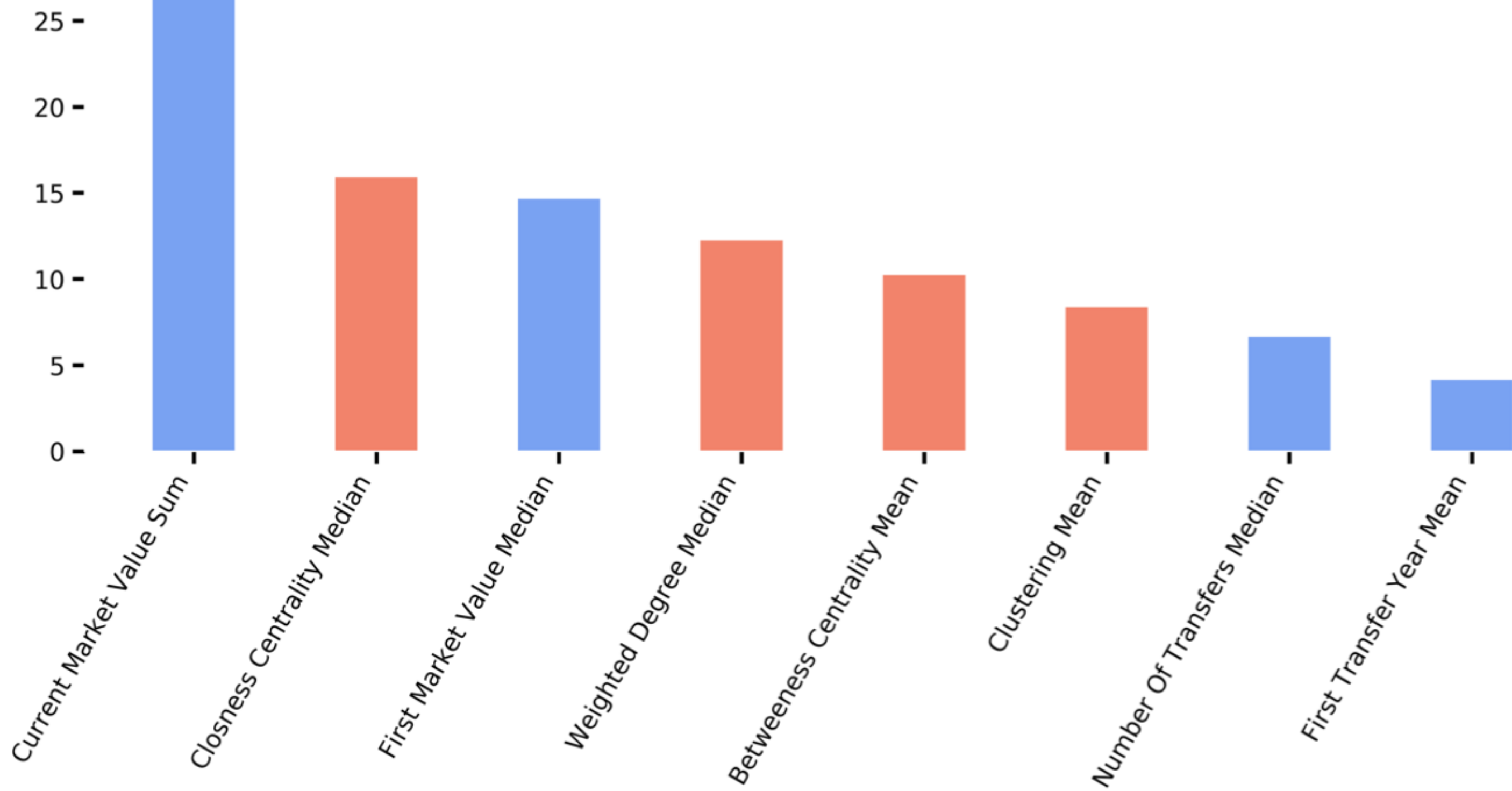
Id	first_transfer_year
Cristiano Ronaldo	1995
Daley Blind	1998
Mario Götze	1998
Ilkay Gündogan	1998
Serge Gnabry	2000
Thomas Müller	2000
Lionel Messi	2000
Luka Modric	2000
Kevin Trapp	2000
Mateo Kovacic	2000

Id	current_market_value
Kylian Mbappé	160000000.0
Vinicius Junior	120000000.0
Federico Valverde	100000000.0
Jamal Musiala	100000000.0
Jude Bellingham	100000000.0
Pedri	100000000.0
Harry Kane	90000000.0
Rafael Leão	85000000.0
Rodrygo	80000000.0
Bernardo Silva	80000000.0

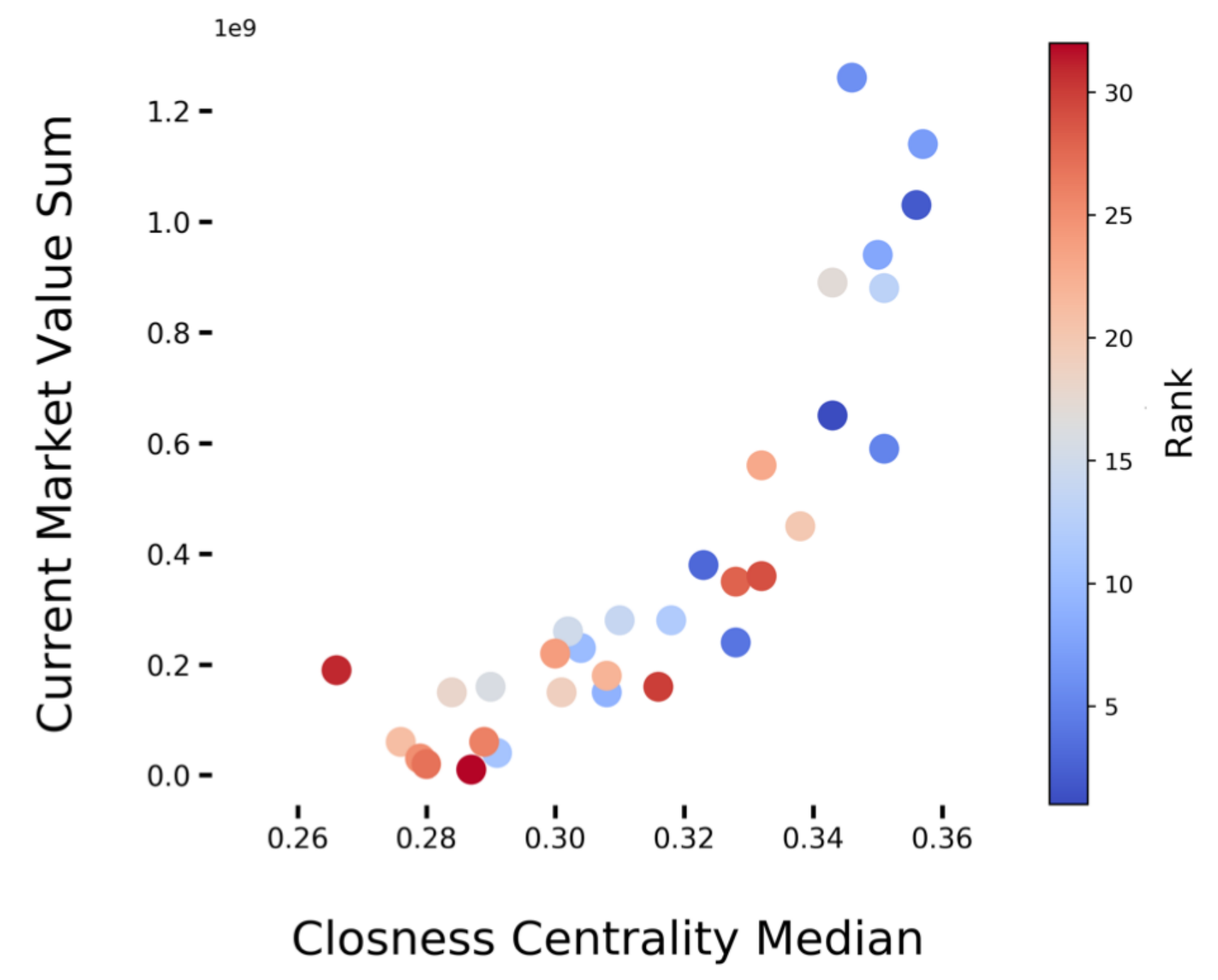
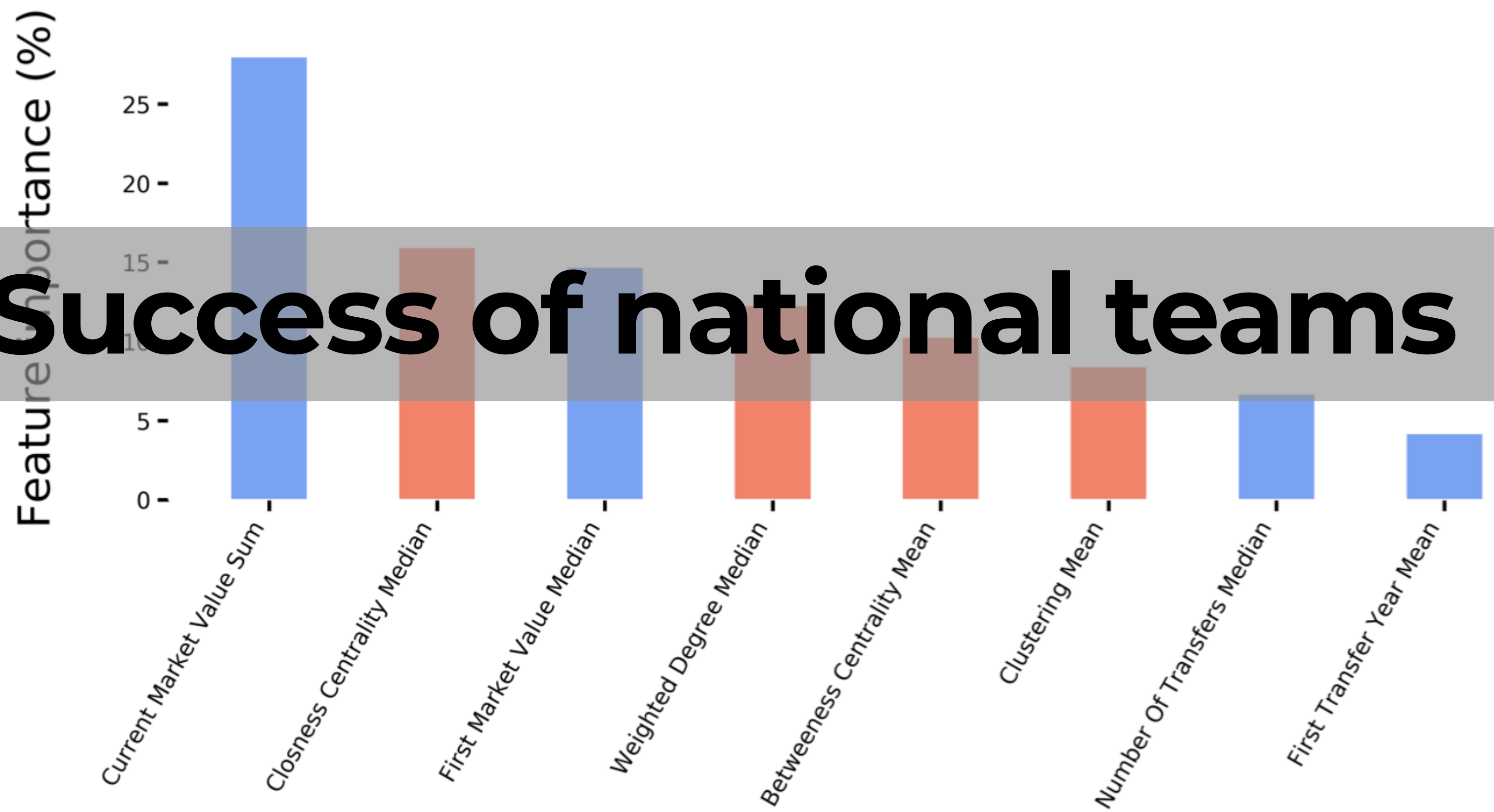
Id	first_market_value
Lucas Hernández	70000000.0
Cristiano Ronaldo	60000000.0
Eduardo Camavinga	55000000.0
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Serge Gnabry	2000
Thomas Müller	2000
Lionel Messi	2000
Luka Modric	2000
Kevin Trapp	2000
Mateo Kovacic	2000

Feature importance (%)



Success of national teams



Network of players

SQUAD OF FC BARCELONA

Filter by season






































22/23

Show

Compact

Detailed

Gallery

# ↑	Player ↑	Date of birth / Age ↑	Nat.	Market value ↑
1	 Marc-André ter Stegen Goalkeeper	Apr 30, 1992 (30)		€30.00m
13	 Iñaki Peña Goalkeeper 	Mar 2, 1999 (23)		€4.00m
36	 Arnau Tenas Goalkeeper	May 30, 2001 (21)		€2.00m
4	 Ronald Araújo Centre-Back	Mar 7, 1999 (23)	 	€60.00m
23	 Jules Kounde Centre-Back 	Nov 12, 1998 (24)	 	€60.00m
15	 Andreas Christensen Centre-Back 	Apr 10, 1996 (26)		€30.00m
24	 Eric García Centre-Back	Jan 9, 2001 (22)		€18.00m
28	 Alejandro Balde Left-Back 	Oct 18, 2003 (19)	 	€15.00m
17	 Marcos Alonso Left-Back 	Dec 28, 1990 (32)		€9.00m
18	 Jordi Alba Left-Back	Mar 21, 1989 (33)		€5.00m
20	 Sergi Roberto Right-Back	Feb 7, 1992 (31)		€6.00m
5	 Sergio Busquets  Defensive Midfield	Jul 16, 1988 (34)		€5.00m
8	 Pedri Central Midfield	Nov 25, 2002 (20)		€100.00m
6	 Gavi Central Midfield	Aug 5, 2004 (18)		€90.00m

Network of players

SQUAD OF FC BARCELONA

Filter by season






































22/23

Show

Compact

Detailed

Gallery

# ↑	Player ↑	Date of birth / Age ↑	Nat.	Market value ↑
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24	 Eric García Centre-Back	Jan 9, 2001 (22)		€18.00m
28	 Alejandro Balde Left-Back 	Oct 18, 2003 (19)	 	€15.00m
17	 Marcos Alonso Left-Back 	Dec 28, 1990 (32)		€9.00m
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20	 Sergi Roberto Right-Back	Feb 7, 1992 (31)		€6.00m
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6	 Gavi Central Midfield	Aug 5, 2004 (18)		€90.00m



Take-away

Network are even in sport success



II. Gyakorlat - Python

Data

Location: https://github.com/milanjanosov/TheWitcher/blob/main/witcher_edge_properties.csv

This is an **edge list**!

Source	Target	Type	Id	Weight
Geralt	Niedamir	Undirected	0	51
Geralt	Eyck	Undirected	1	54
Geralt	Dorregaray	Undirected	2	99
Geralt	Yennefer	Undirected	3	847
Geralt	Gyllenstiern	Undirected	4	49
Geralt	Yarpen	Undirected	5	161
Geralt	Boholt	Undirected	6	64
Geralt	Kennet	Undirected	7	2
Geralt	Villentretenmerth	Undirected	8	26
Geralt	Istredd	Undirected	9	74
Geralt	Herbolth	Undirected	10	35

Steps

```
import pandas as pd
import networkx as nx
```

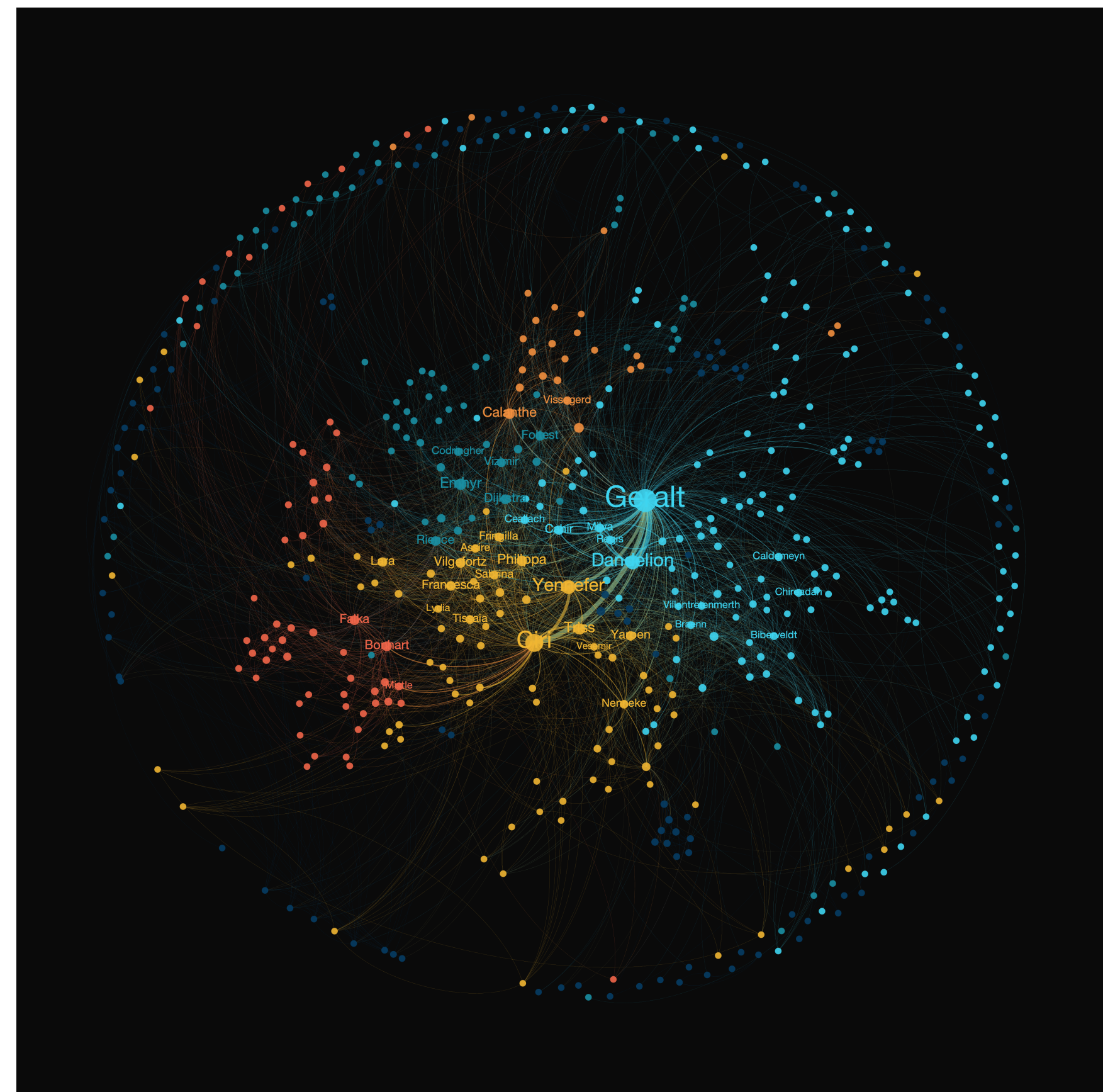
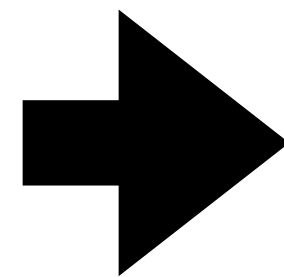
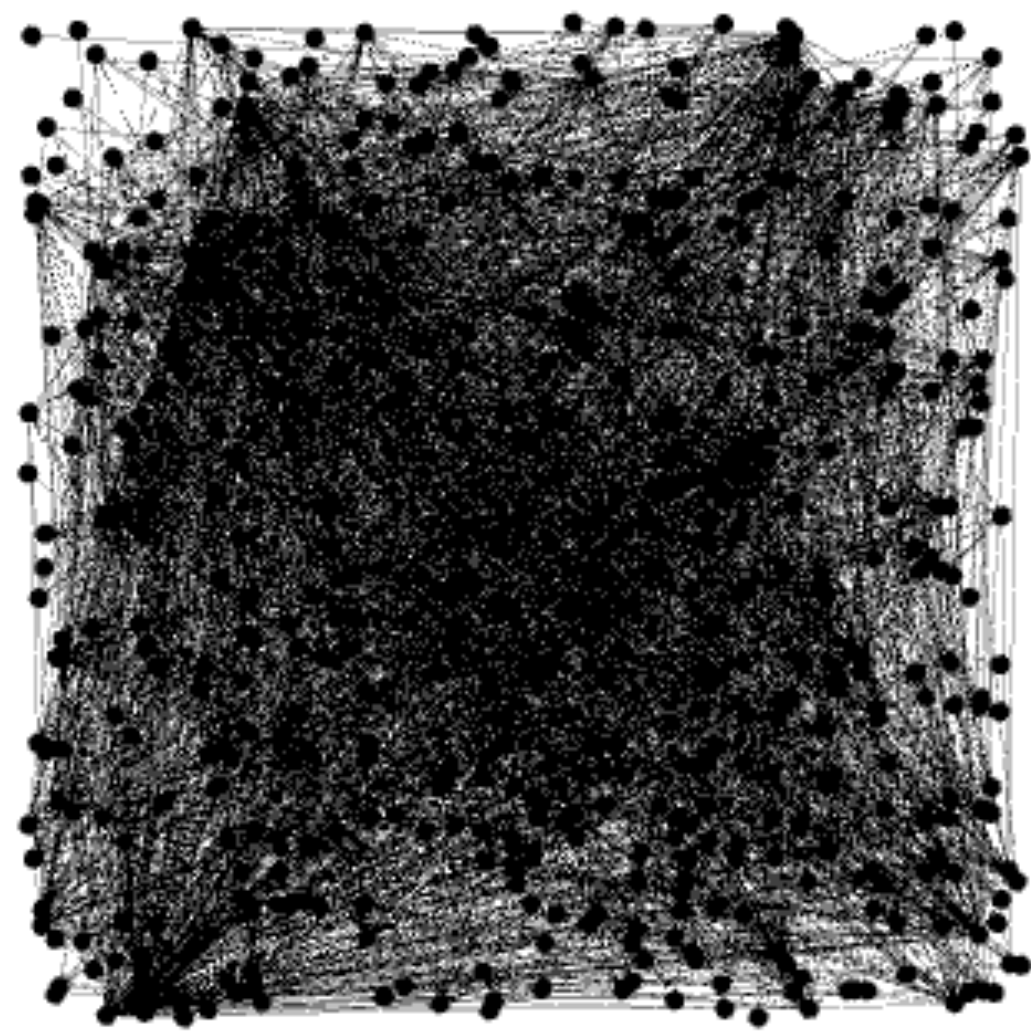
1. Read in the edge list with Pandas
2. Task - which names have the largest number of edges?
3. Create a Graph object with networkx from the edge list data frame
4. Characterize the network: edge weights, number of nodes, edges, and the degree distribution
5. Draw the network with networkx - basic visualization
6. Write the Graph object into a gexf file



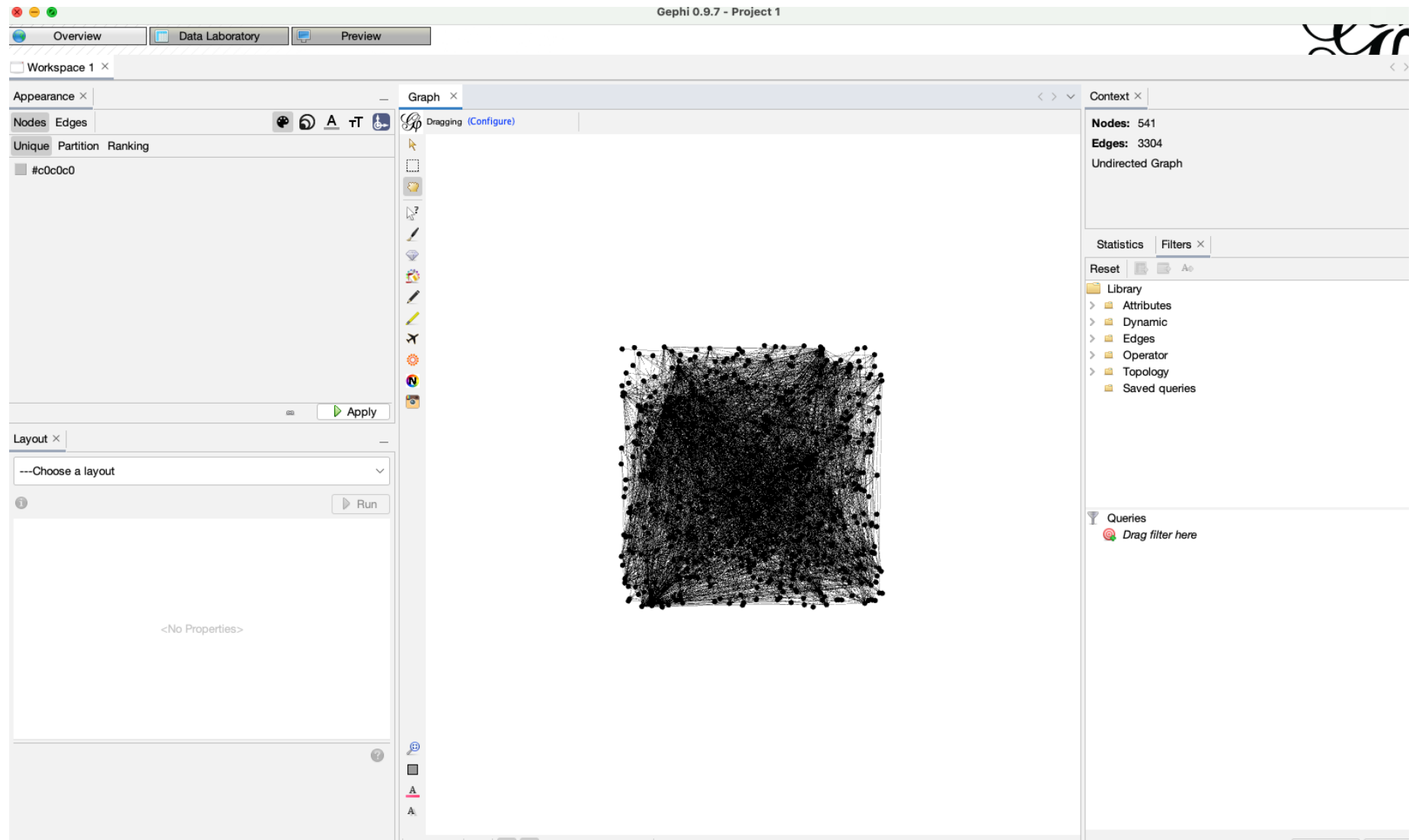
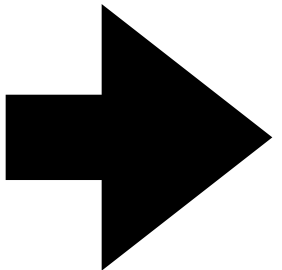
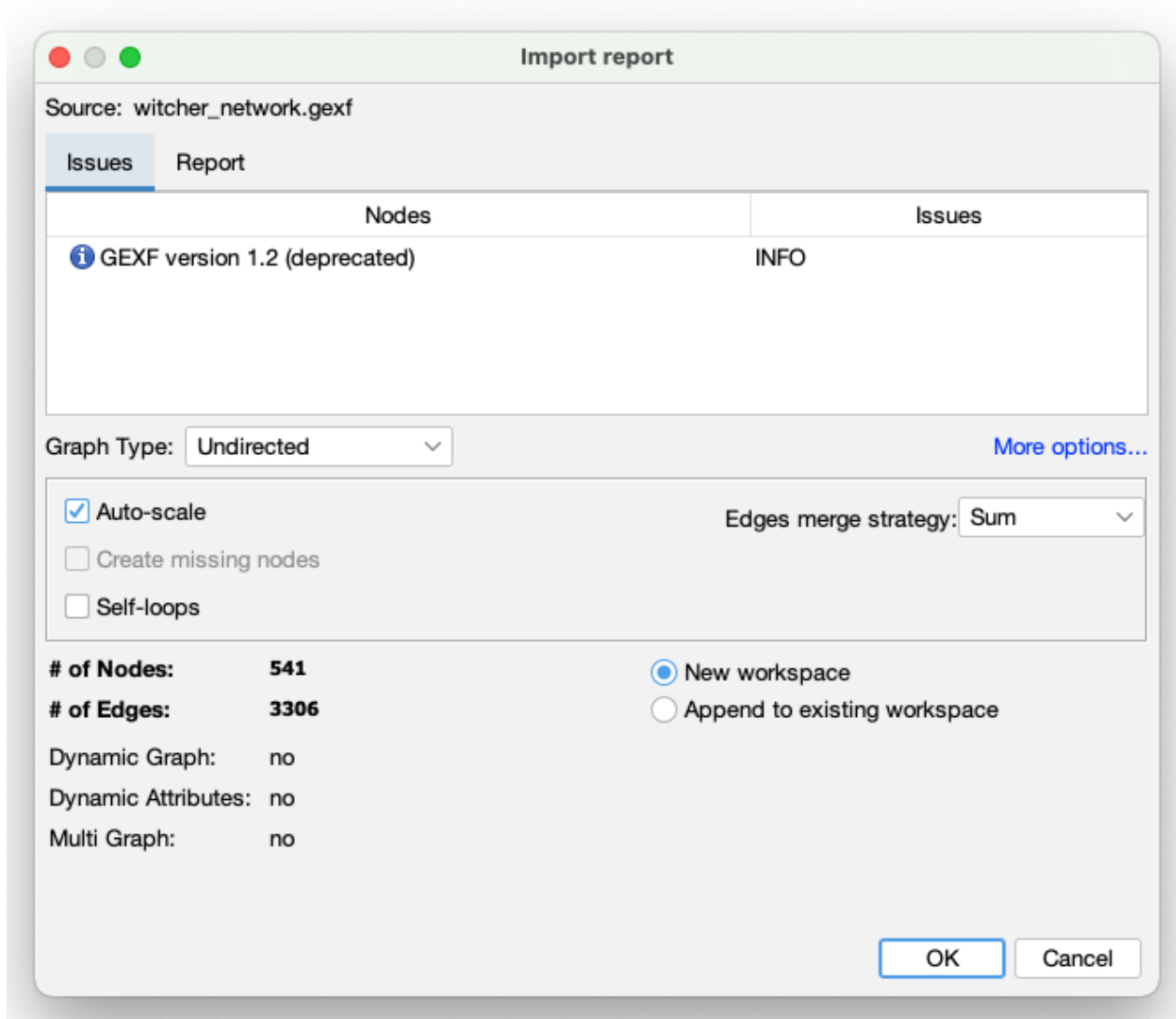
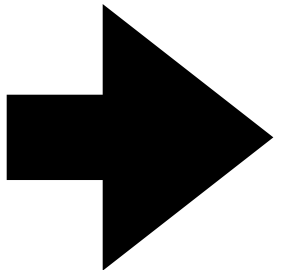
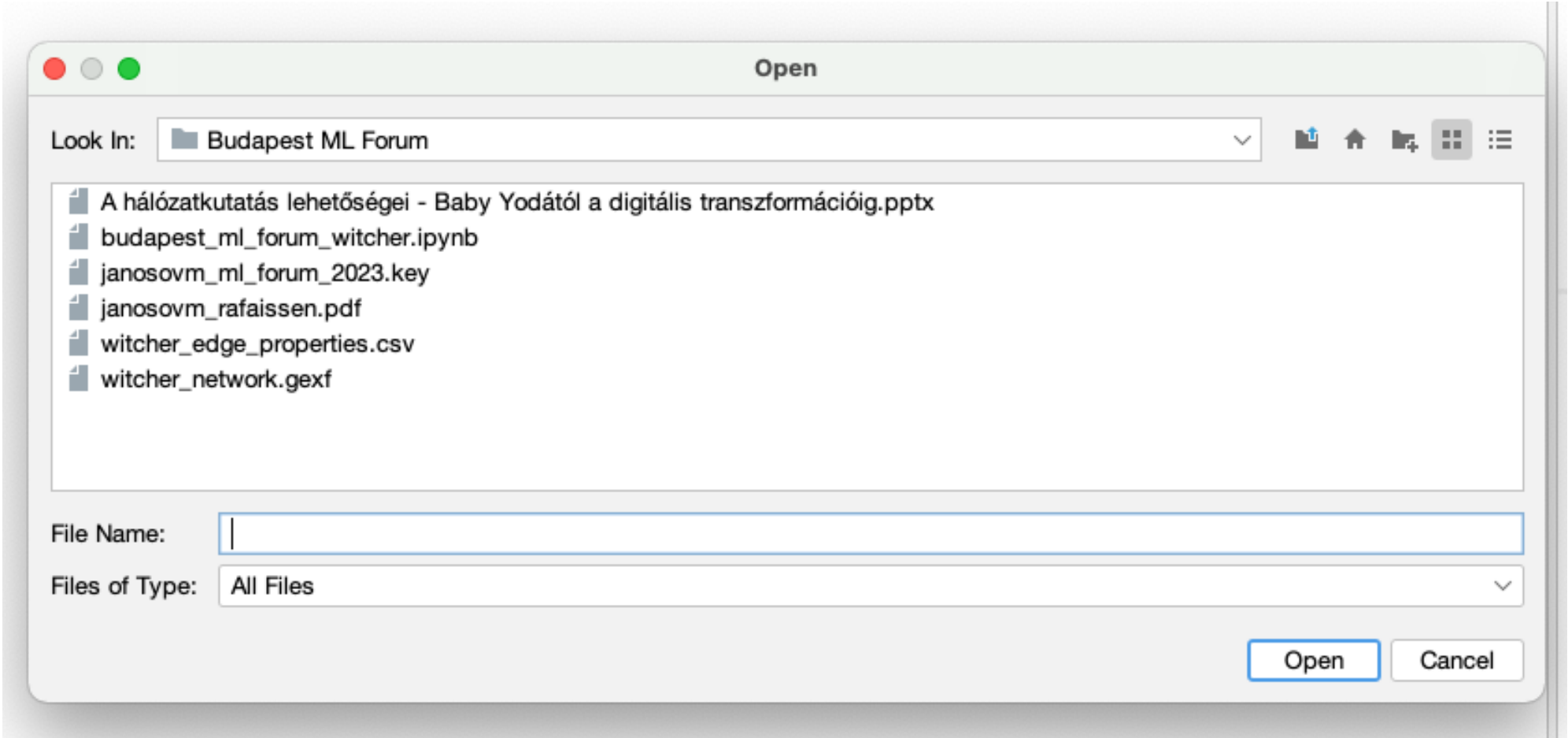
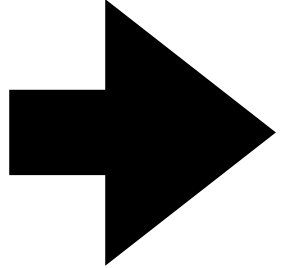
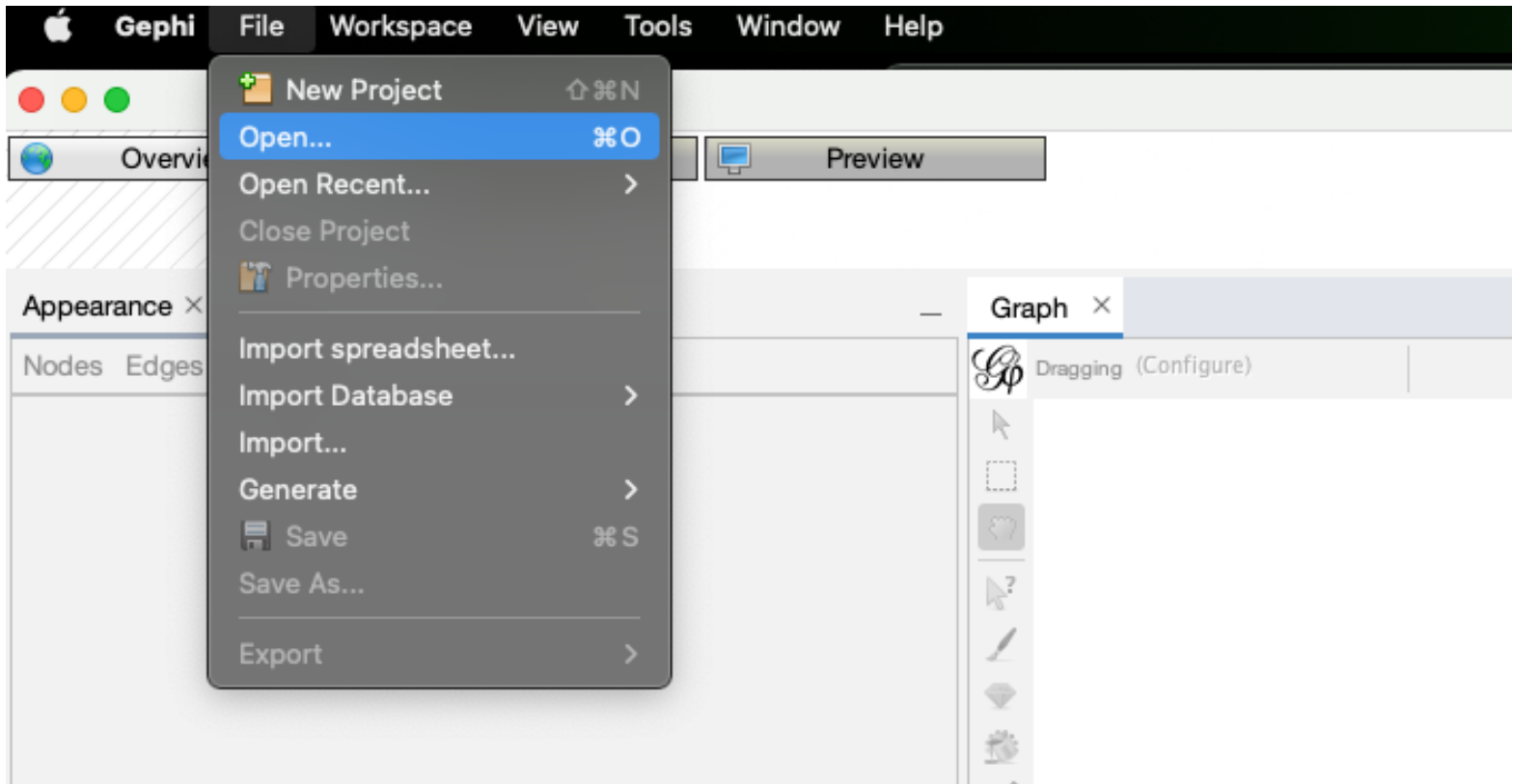
III. Gyakorlat - Gephi

Task

From this to that

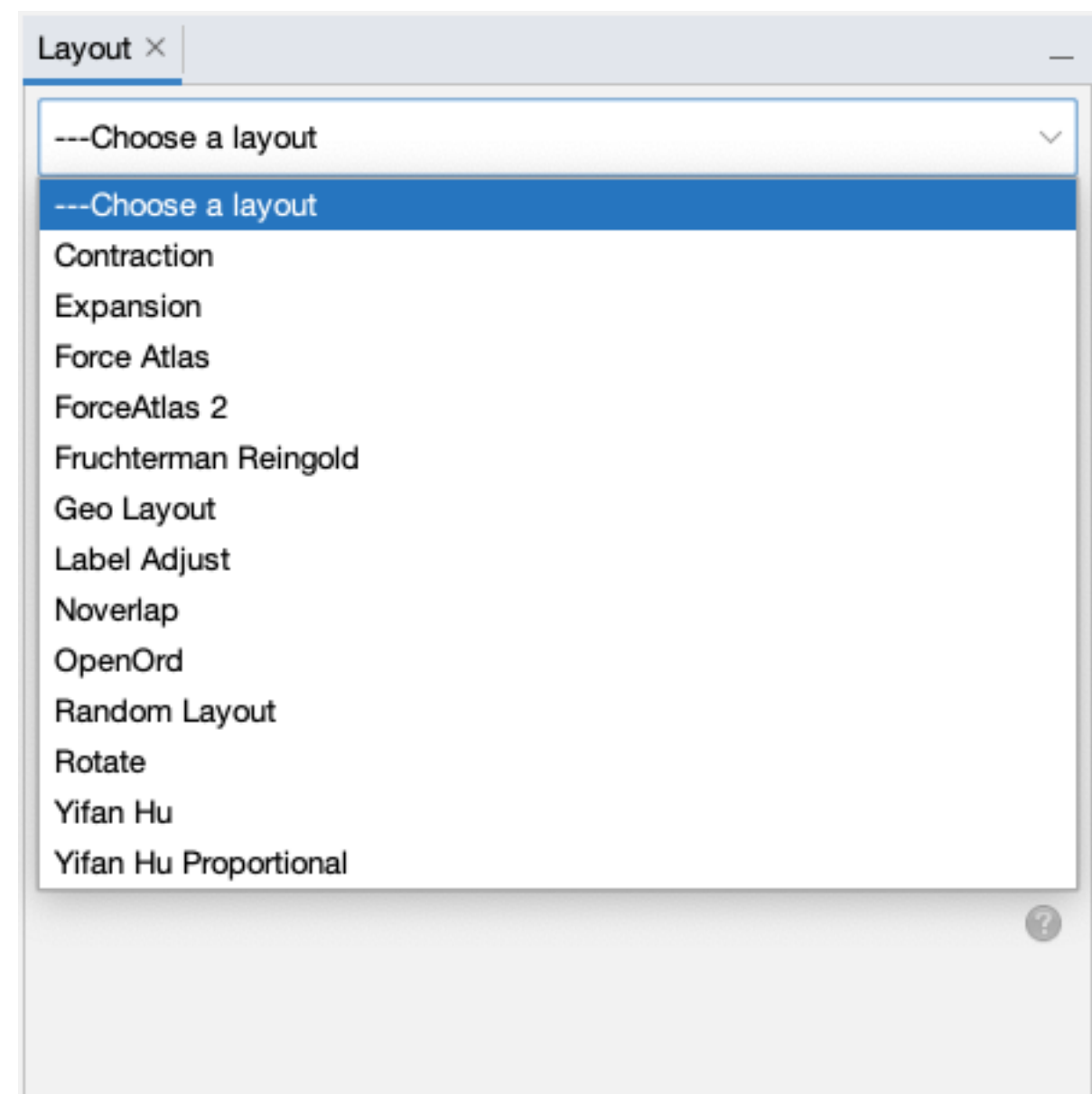


Load the gexf file



Format the network

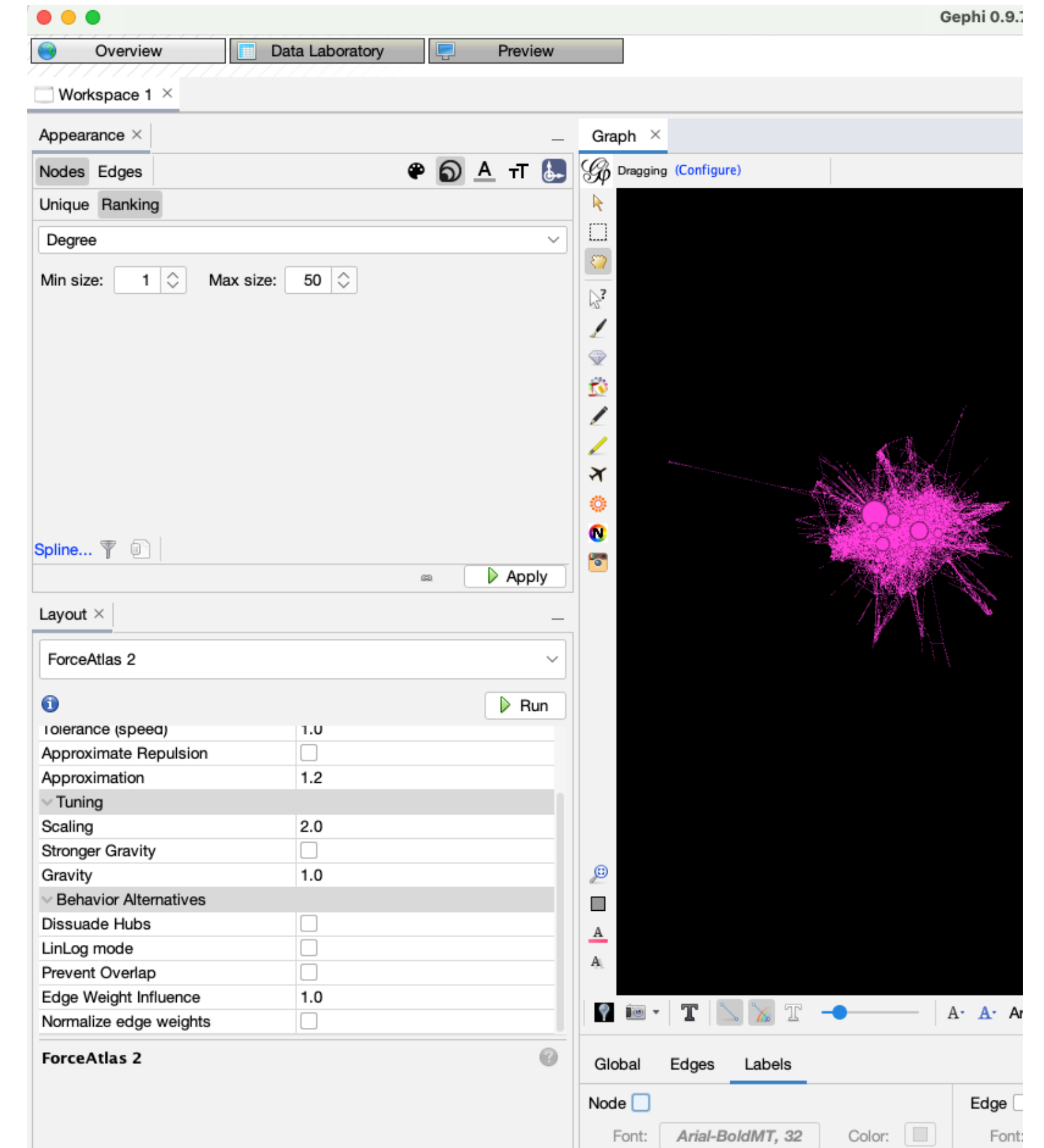
Select a node layout



Node size and color



Test color



Preview, saving

The screenshot displays the Gephi 0.9.7 - Project 1 interface. The main window is titled "Preview" and shows a network graph with nodes and edges. The nodes are represented by circles of varying sizes, and the edges are thin lines connecting them. The graph is rendered in a dark theme with a black background.

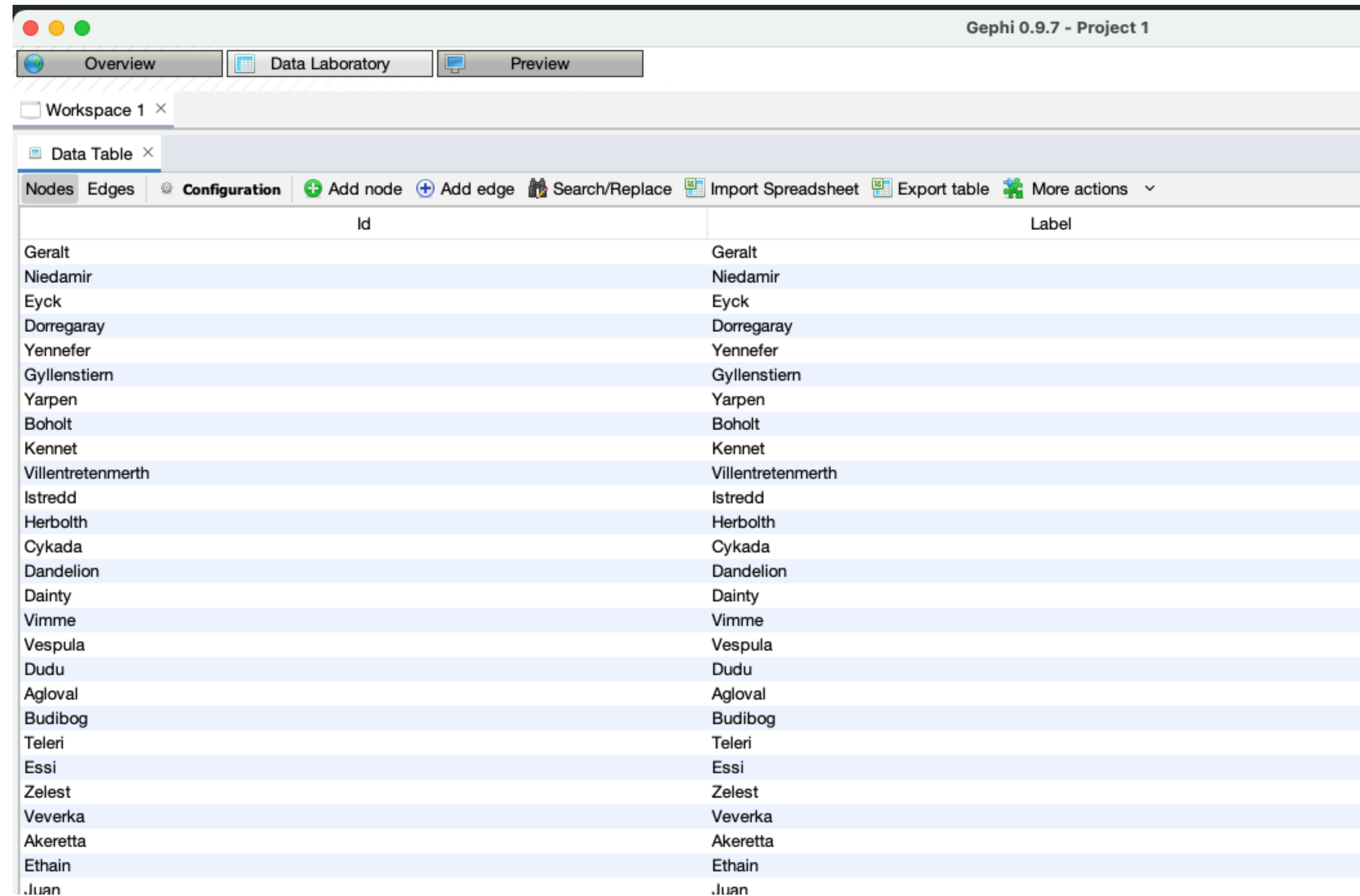
The "Preview Settings" panel is visible on the left side of the window. It contains the following settings:

- Presets:** Default
- Settings:** Manage renderers
- Nodes:**
 - Border Width: 1.0
 - Border Color: custom [0,0,0]
 - Opacity: 100.0
 - Per-Node Opacity:
- Node Labels:**
 - Show Labels:
 - Font: Arial 12 Plain
 - Proportional size:
 - Color: custom [0,0,0]
 - Shorten label:
 - Max characters: 30
 - Outline size: 0.0
 - Outline color: custom [255,255,255]
 - Outline opacity: 80.0
 - Box:
 - Box color: parent
 - Box opacity: 100.0
- Edges:**
 - Show Edges:
 - Thickness: 1.0
 - Rescale weight:
 - Min. rescaled weight: 0.1
 - Max. rescaled weight: 1.0
 - Color: mixed
 - Opacity: 100.0
 - Curved:
 - Radius: 0.0
- Edge Arrows:**
 - Size: 3.0
- Edge Labels:**
 - Show Labels:
 - Font: Arial 10 Plain
 - Color: original

At the bottom of the Preview Settings panel, there is a "Preview ratio: 100%" slider and a "Refresh" button. Below the slider, the export options are listed as "Export: SVG/PDF/PNG".

The main Preview window shows a network graph with nodes and edges. The nodes are represented by circles of varying sizes, and the edges are thin lines connecting them. The graph is rendered in a dark theme with a black background. At the bottom of the Preview window, there is a "Background" button and a "Reset zoom" button with minus and plus signs.

Node and edge stats



The screenshot shows the Gephi 0.9.7 interface. At the top, there are three tabs: Overview, Data Laboratory, and Preview. Below these is a workspace area labeled 'Workspace 1'. The main window is titled 'Data Table' and contains a table with two columns: 'Id' and 'Label'. The table lists 25 nodes, each with an 'Id' and a 'Label' that are identical. The nodes are: Geralt, Niedamir, Eyck, Dorregaray, Yennefer, Gyllenstiern, Yarpén, Boholt, Kennet, Villentretenmerth, Istredd, Herbolth, Cykada, Dandelion, Dainty, Vimme, Vespula, Dudu, Agloval, Budibog, Teleri, Essi, Zelest, Veverka, Akeretta, Ethain, and .Juan.

Id	Label
Geralt	Geralt
Niedamir	Niedamir
Eyck	Eyck
Dorregaray	Dorregaray
Yennefer	Yennefer
Gyllenstiern	Gyllenstiern
Yarpén	Yarpén
Boholt	Boholt
Kennet	Kennet
Villentretenmerth	Villentretenmerth
Istredd	Istredd
Herbolth	Herbolth
Cykada	Cykada
Dandelion	Dandelion
Dainty	Dainty
Vimme	Vimme
Vespula	Vespula
Dudu	Dudu
Agloval	Agloval
Budibog	Budibog
Teleri	Teleri
Essi	Essi
Zelest	Zelest
Veverka	Veverka
Akeretta	Akeretta
Ethain	Ethain
.Juan	.Juan



Milan Janosov, PhD

NETWORK SCIENTIST

DATA SCIENCE RESEARCHER

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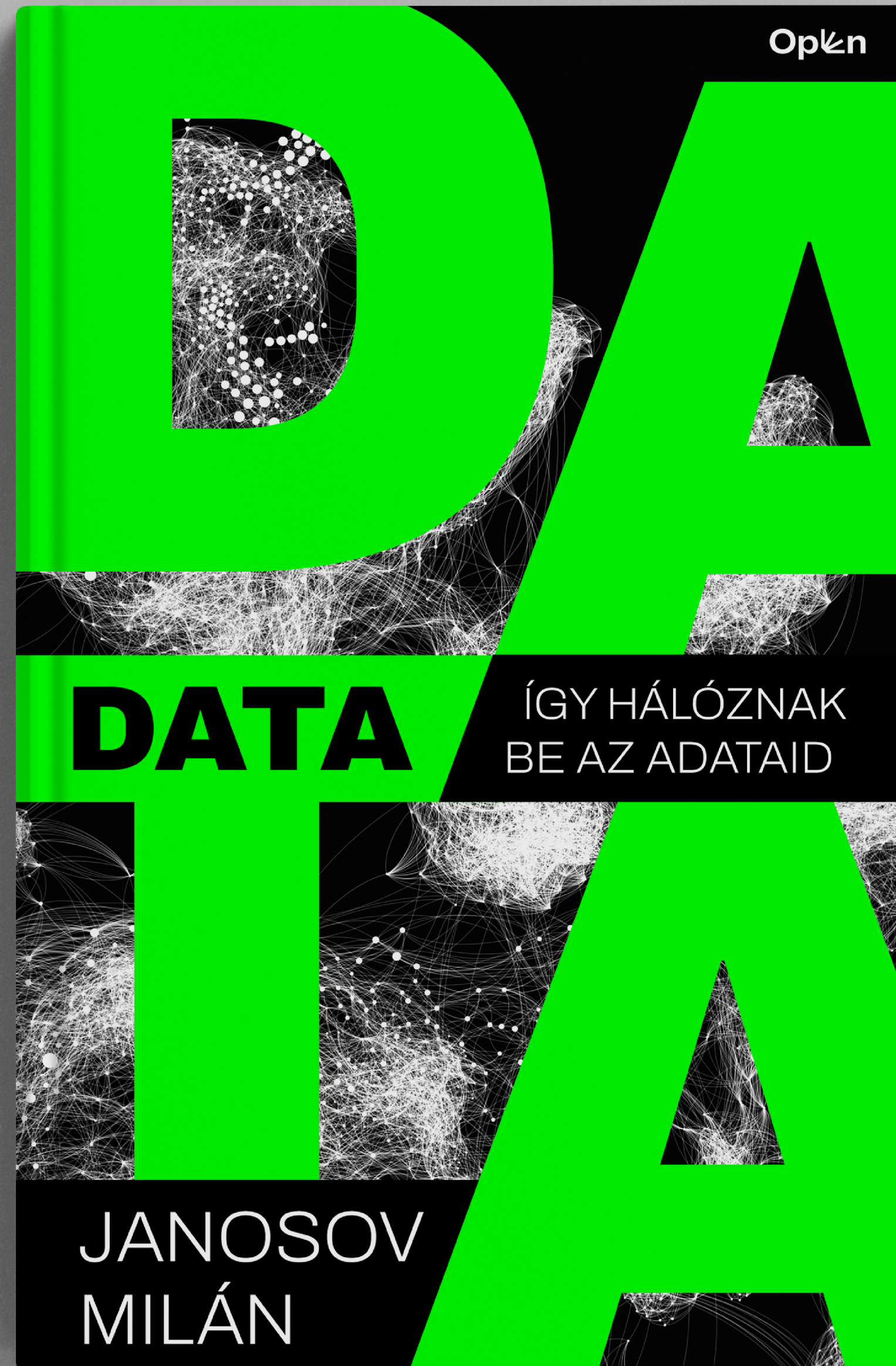
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