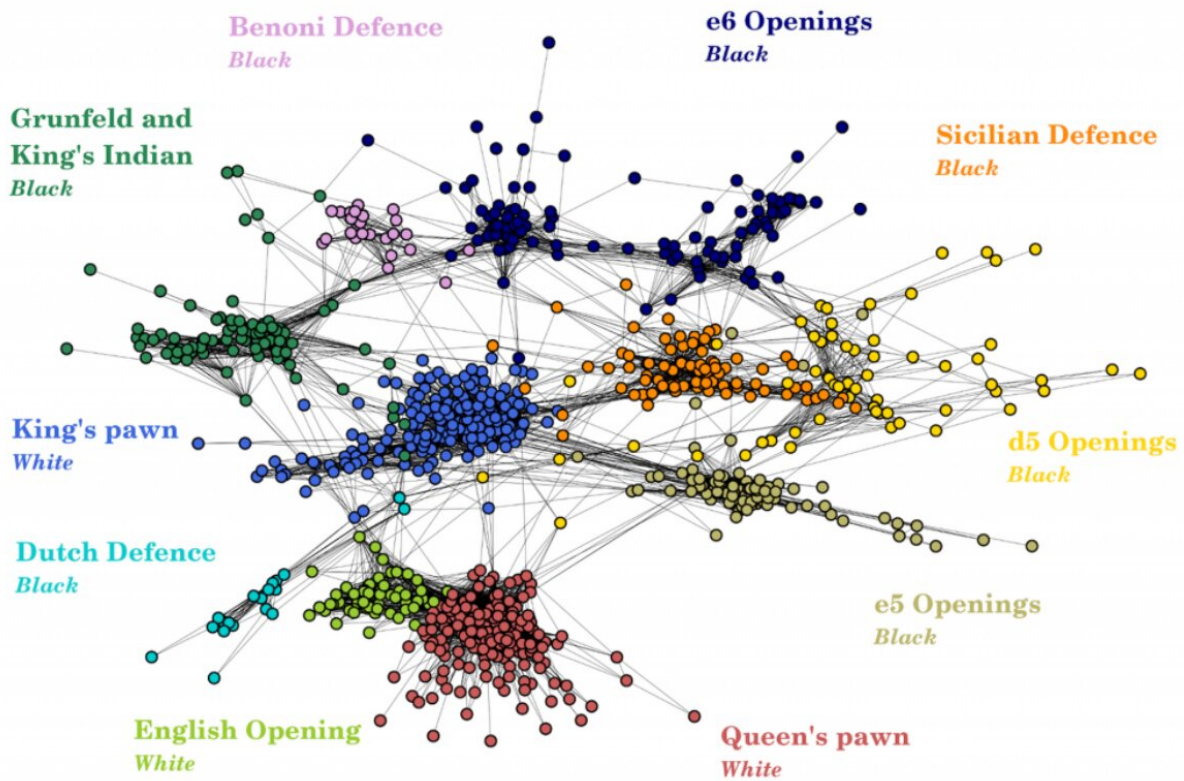


Researchers create new classification of chess openings

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The new method identified ten clusters of chess openings represented with different colors. Openings that are close to each other on this network appear often together in the repertoire of players. Credit: © Complexity Science Hub

Using real data from an online chess platform, scientists of the Complexity Science Hub and the Centro Ricerche Enrico Fermi (CREF)

studied similarities of different chess openings. Based on these similarities, they developed a new classification method which can complement the standard classification.

"To find out how similar chess openings actually are to each other—meaning in real [game](#) behavior—we drew on the wisdom of the crowd," Giordano De Marzo of the Complexity Science Hub and the Centro Ricerche Enrico Fermi (CREF) explains. The researchers analyzed 3,746,135 chess games, 18,253 [players](#) and 988 different openings from the chess platform Lichess and observed who plays which opening games. If several players choose two specific opening games over and over again, it stands to reason that they will be similar. Opening games that are so popular that they occur together with most others were excluded.

"We also only included players in our analyses that had a rating above 2,000 on the platform Lichess. Total novices could randomly play any opening games, which would skew our analyses," explains Vito D.P. Servedio of the Complexity Science Hub. The study "Quantifying the complexity and similarity of chess openings using online chess community data" has been published in *Scientific Reports*.

Ten clusters clearly delineated

In this way, the researchers found that certain opening games group together. Ten different clusters clearly stood out according to actual similarities in playing behavior. "And these clusters don't necessarily coincide with the common classification of chess openings," says De Marzo.

For example, certain opening games from different classes were played repeatedly by the same players. Therefore, although these strategies are classified in different classes, they must have some similarity. So, they

are all in the same cluster. Each cluster thus represents a certain style of play—for example, rather defensive or very offensive. Moreover, the method of classification that the researchers have developed here can be applied not only to chess, but to similar games such as Go or Stratego.

Complement the standard classification

The opening phase in chess is usually less than 20 moves. Depending on which pieces are moved first, one speaks of an open, half-open, closed or irregular opening. The standard [classification](#), the so-called ECO Code (Encyclopedia of Chess Openings), divides them into five main groups: A, B, C, D and E.

"Since this has evolved historically, it contains very useful information. Our clustering represents a new order that is close to the used one and can add to it by showing players how similar openings actually are to each other," Servedio explains. After all, something that grows historically cannot be reordered from scratch. "You can't say A20 now becomes B3. That would be like trying to exchange words in a language," adds De Marzo.

Rate players and opening games

In addition, their method also allowed the researchers to determine how good a player and how difficult a particular opening game is. The basic assumption: if a particular opening game is played by many people, it is likely to be rather easy. So, they examined which opening games were played the most and who played them. This gave the researchers a measure of how difficult an opening game is (= complexity) and a measure of how good a player is (= fitness). Matching these with the players' rating on the chess platform itself showed a significant correlation.

"On the one hand, this underlines the significance of our two newly introduced measures, but also the accuracy of our analysis," explains Servedio. To ensure the relevance and validity of these results from a chess theory perspective, the researchers sought the expertise of a renowned [chess](#) grandmaster who wishes to remain anonymous.

More information: Giordano De Marzo et al, Quantifying the complexity and similarity of chess openings using online chess community data, *Scientific Reports* (2023). [DOI: 10.1038/s41598-023-31658-w](#)

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