Google matrix analysis of worldwide football mercato

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Abstract

The worldwide football transfer market is analyzed as a directed complex network: the football clubs are the network nodes and the directed edges are weighted by the total amount of money transferred from a club to another. The Google matrix description allows to treat every club independently of their richness and allows to measure for a given club the efficiency of player sales and player acquisitions. The PageRank algorithm, developed initially for the World Wide Web, naturally characterizes the ability of a club to import players. The CheiRank algorithm, also developed to analyze large scale directed complex networks, characterizes the ability of a club to export players. The analysis in the two-dimensional PageRank-CheiRank plan permits to determine the transfer balance of the clubs in a more subtle manner than the traditional import-export scheme. We investigate the 2017-2018 mercato concerning 2296 clubs, 6698 player transfers, and 147 player nationalities. The transfer balance is determined globally for different types of player trades (defender, midfielder, forward, ...) and for different national football leagues. Although, on average, the network transfer flows from and to clubs are balanced, the discrimination by player type draws a specific portrait of each football club.

Keywords: Football transfer market, Google matrix, Markov chains, Complex networks, PageRank, CheiRank.