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Measuring countries' progress in sustainable development through network theory

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The Agenda 2030 of sustainable development introduced in 2015 by the United Nations is a call for action to address the major challenges the world faces [1]. To tackle these challenges, the Agenda defines the 17 Sustainable Development Goals (SDGs), which have been conceived with respect to five pillars (planet, people, prosperity, peace and partnership), thus creating synergies and trade-offs among the Goals. The Agenda also addresses the need for more targeted policy implementations, totaling 169 targets across the Goals. Moreover, indicators have been defined to measure progresses in each target, and so, Goal.

To create aggregated scores of such countries' performance indicators is a recurrent and crucial issue within the SDGs framework, where several methodologies have been proposed to create a ranking of countries which can provide insights about the fulfillment of all of the Agenda's objectives and principles (see, e.g., Sachs et. al. [2] and Biggeri et al. [3]). In light of the complex nature of the Agenda (as pointed out by LeBlanc [4]), we argue that the use of multidisciplinary tools is essential to help shed light on how to address efforts in global sustainable development. In particular, network theory can be used to create several aggregated scores that can actually account for the complex nature of the Agenda, the synergies and trade-offs among the Goals and, no less, of the role of countries toward the achievement of SDGs.

In this work, we recast the data concerning the performances of countries in each Goal's indicators as the incidence matrix of a bipartite system constituted of two sets: countries and Goals, connected by the performances of countries within each Goal. We exemplify our framework using the data taken from the 2020 SDG Index and Dashboard by Sachs et al. [2]. We show that, framed within network science, the SDG Index coincides with measuring the degree centrality of countries within this bipartite system and that such measure neglects the heterogeneity of countries in tackling the Goals and their responsibilities at the global scale. More informative centrality measures, and so, aggregated scores, can be obtained by the adoption of the economic complexity theory, in particular, the GENEPY framework [5]. The GENEPY rationale defines a data-driven weighting scheme in which relative countries' performances of all SDGs are considered to define a more comprehensive ranking of countries.

References:

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