Global Analysis of Food and Nutrition: What the Human Body Wants SEUNGHYEON KIM, Asia Pacific Center for Theoretical Physics, Pohang, MATHIAS FOO, JAEYUN SUNG, Asia Pacific Center for Theoretical Physics, Pohang, South Korea, YONG-SU JIN, Department of Food Science and Human Nutrition, University of Illinois at Urbana-Champaign, Urbana, USA, PAN-JUN KIM, Asia Pacific Center for Theoretical Physics, Pohang, South Korea — There is currently an abundance of quantitative information regarding foods we consume, such as their total nutrient composition and daily nutritional requirements. In this study, we systematically analyzed such large-scale data of foods to better understand how the composition of foods affects their overall nutritional value. Herein, we constructed two types of networks that reflect nutritional data from about 700 food products: 1) The Food-food Network, in which each edge connects a pair of foods having similar nutritional contents; and 2) the Nutrient-nutrient Network, which is based on co-occurrence patterns of different nutrients across foods. By adopting the insight we obtained from the topological properties of these networks, we present a novel measure to quantify the overall nutritional value of a food, which we call the Nutritional Fitness (NF). Some nutrients can hinder foods from having high NF, acting as "nutritional bottlenecks." Interestingly, a food's NF is not only affected by individual nutrients, but also pairs of nutrients. To this effect, foods with very high NFs tend to have unique nutrient pairs not observed from the majority of foods. To summarize, our study provides insight into how NF and nutrients are intricately related.

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