Additive and Analytic Combinatorics

Additive combinatorics is the theory of counting additive structures in sets. This theory has seen exciting developments and dramatic changes in direction in recent years thanks to its connections with areas such as harmonic analysis, ergodic theory, and representation theory. As it turns out, many combinatorial ideas that have existed in the combinatorics community for quite some time can be used to attack notorious problems in other areas of mathematics. A typical example is the Green-Tao theorem on the existence of long arithmetic progressions in primes, which uses a famous theorem of Szemerédi on arithmetic progressions in dense sets as a key component. The field is also of great interest to computer scientists; a number of the techniques and theorems have seen application in, for example, communication complexity, property testing, and the design of randomness extractors.