Geophysical Research Abstracts
Vol. 17, EGU2015-15611-1, 2015
EGU General Assembly 2015

Forecasting rain events - Meteorological models or collective intelligence?

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Collective intelligence is shared (or group) intelligence that emerges from the collective efforts of many individuals. Collective intelligence is the aggregate of individual contributions: from simple collective decision making to more sophisticated aggregations such as in crowdsourcing and peer-production systems. In particular, collective intelligence could be used in making predictions about future events, for example by using prediction markets to forecast election results, stock prices, or the outcomes of sport events.
To date, there is little research regarding the use of collective intelligence for prediction of weather forecasting. The objective of this study is to investigate the extent to which collective intelligence could be utilized to accurately predict weather events, and in particular rainfall. Our analyses employ metrics of group intelligence, as well as compare the accuracy of groups' predictions against the predictions of the standard model used by the National Meteorological Services.
We report on preliminary results from a study conducted over the 2013-2014 and 2014-2015 winters. We have built a web site that allows people to make predictions on precipitation levels on certain locations. During each competition participants were allowed to enter their precipitation forecasts (i.e. 'bets') at three locations and these locations changed between competitions. A precipitation competition was defined as a 48-96 hour period (depending on the expected weather conditions), bets were open 24-48 hours prior to the competition, and during betting period participants were allowed to change their bets with no limitation. In order to explore the effect of transparency, betting mechanisms varied across study's sites: full transparency (participants able to see each other's bets); partial transparency (participants see the group's average bet); and no transparency (no information of others' bets is made available).
Several interesting findings emerged from this study. First, we found evidence for the emergence of collective intelligence, as the group's mean prediction was superior to individuals' predictions (using the metrics of Collective Intelligence Quality and Win Ratio). Second, we found that overall the group's collective intelligence was not very different from the accuracy of the meteorological model (ECMWF): in 6 out of the 12 competition the results were almost indistinguishable (error differences of less than 2 mm); in 4 cases the model clearly outperformed the group; and in 2 cases the group outperformed the model. Third, the design of the bidding mechanism – namely transparency – seems to affect collective intelligence. Fourth, an analysis of individuals' predictions suggests that local knowledge (measured by the distance between home address and the site of competition) and the level of meteorological knowledge (assessed by a short quiz) were not correlated with prediction accuracy.
Although, the findings reported here present only preliminary results from a long-term project and while we acknowledge that it is not possible to draw statistically significant conclusions from a study of 12 cases, our findings do reveal some important insights. Our results inform research on collective intelligence and meteorology, as well as have implications for practice (e.g. possibly incorporating collective intelligence into weather forecasting models).