Hypernetwork-based peer marking for scalable certificated mass education

Conference or Workshop Item

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The basic idea is that good markers will be more highly connected than bad markers. Suppose a class of students have ten assessment tasks, with each student producing an answer for each task. Consider two students peer-marking exactly the same set of answers. If the are good markers, their marks will tend to be similar on each question, being close to the ‘correct mark’, and they will be \textit{10-similar}. Now consider two poor students marking exactly the same set of ten answers. These students will give marks that deviate a lot from the ‘correct’ score and are unlikely to give the same marks, \textit{e.g.} they may be arbitrarily higher and lower. These poor students are likely to be relatively disconnected. Thus being highly connected is \textit{necessary} for two markers to be good while being relatively disconnected is \textit{sufficient} for one or both of a pair of markers to be bad.

In our experiment we have fifty Open University PhD students and three researchers studying a specially prepared short course on Global Systems Science. For each lesson, these students read a short text and complete an assignment with five questions. They upload these to our \textit{Étoile} peer marking platform. The students peer-mark the assignments of three other students, and then they mark their own assignment. If the self-assessment is different from the peer-assessment this gives useful diagnostic information. An important feature of our experimental design is that we make the peer-marking symmetric – if student \(a\) marks student \(b\)’s answer then student \(b\) marks student \(a\)’s answer. A consequence of this is that for each assignment the students are assembled into groups of four, with each student marking the work of the other three in the group. Such groups are hypersimplices\(^3\), \(< a, b, c, d; R >\), where \(a, b, c,\) and \(d\) are students and \(R\) is the 4-ary relation that binds them together. Clearly \(R\) is a very interesting relation that give a lot of diagnostic information. For the next assignment the students are grouped differently. For example, as \(< a, b, e, f; R’ >\) and \(< c, d, h, g; R’ >\). We have seven assignments, so each student is related to \(7 \times 4 = 28\) answers. By designing the hypernetwork of hypersimplices appropriately, for example, eight student markers can pairwise share 12 answers. Thus two good students can have up to twelve similar marks and be 12-similar, while bad markers will be less highly connected. We are investigating the hypernetwork connectivity of marking groups of eight and sixteen students. Our experiment will investigate various underlying topologies for establishing marker reputations in a robust way, to provide demonstrably high-quality peer marking.

The experiment will be complete at the end of May 2014. Our full paper will publish the data and report the results of the hypernetwork-based method of identifying good and bad peer marking.