Denes Csala | Motivation Letter

I was delighted to read about this postdoctoral position in urban complex systems modeling!

In recent decades in science we have witnessed a tremendous boom in the engineering, medical and computer sciences. However, social sciences were a bit lacking behind – mostly because of the cumbersome social data-collection necessities. The exponential increase in data availability and information visualization also put some other fields in the spotlight as well, starting with the early 90s: statistical physics and network science, as well as multi-agent systems and more recently an emerging computerized statistical data mining, analysis and visualization field collectively called data science. Therefore, perhaps for the first time in history we have the theoretical background, the modelling tools – by transferring the lessons from engineering – to foster understanding and create higher confidence dynamic forecasts of behaviors of complex systems. And what could be more complex than society? In the long term, I envision to contribute to a new theory of systems - not that it hasn't been done before, but this time is different: we have big data!

On order to progress towards this vision, in the near term I think I could contribute to Senseable's projects through my skills in complex systems modeling, data analytics and visualization, and social network analysis. At the dawn of the big data age, data science initiatives are many in number and great in diversity, but close to none of them have as an aim the advancement of basic complex systems theory. Recently applications of network theory, spearheaded by Professor Barabasi's group at Northeastern, have been great in number and diversity, form social networks to diseases, however, there seems to be a deadlock, when it comes to their development on the elementary, theoretical level. Essentially, the SYSTEM-NETWORK link has not really been made clear and it is largely unexplored territory. I believe that this is the key to understanding socio-physical systems rooted in networks – and I can't think of a better example to start with than a city.

I think the courses I have taken throughout my graduate education at Masdar Institute and MIT describe my profile the best: a marriage of complex systems modeling and data science. I have taken courses in Network Theory and Graphs and Computational Social Science with Dr. Iyad Rahwan, now heading the Scalable Cooperation Group at MIT Media Lab, as well as Multimodal Data Mining, Time Series Analysis, System Dynamics Modeling and Multi-Agent Systems. Throughout my work with data I have extensively used Python (with pandas for data manipulation) and Matlab. For data visualization and representation, I used Javascript and D3.js. I have built dynamic models in AnyLogic (JAVA). Please check out the full list my courses, publications, data visualization and model portfolio on my website.

I am scheduled to finish my PhD degree by the end of May – and I would be available from there onwards – but as part of an existing part-time engagement with Boston University, I will be in Boston for a month, starting with late April. If that is convenient for you, I would be happy to meet up in person and discuss further.

background: Curalytics Network Visualization