1st ACM SIGSPATIAL Workshop on Geo-computational Thinking in Education (GeoEd 2019) Chicago, Illinois, USA - November 5, 2019

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The 1st International Workshop on Geo-computational Thinking in Education (GeoEd 2019) was held in conjunction with the 27th ACM SIGSPATIAL International Conference on Advances in Geographic Information Systems (ACM SIGSPATIAL 2019). The workshop is intended to bring together experts from both geography (or related) and computer science disciplines who have primary interest in geospatial data and technologies, either from academia or industry, to discuss the grand challenges towards improving existing learning pathways through integration of geo-computational thinking in higher education. This could impact a variety of disciplines that increasingly deal with geospatial data beyond geography, such as social sciences, environmental sciences, public policy, climatology, and other geo-related disciplines. The workshop speakers and attendants have discussed their vision on challenges and opportunities of various topics within the workshop scope.

The workshop is part of a bigger vision by the two organizers to integrate their research expertise with education to impact future of learning in various geo-related disciplines. In 2018, the American Association of Geographers has announced the Encoding Geography initiative, which is a long-term commitment to build capacity and broaden participation for computational thinking within the geography discipline. The initiative has several goals towards strengthening the future of geography, including training new generations of undergraduate and graduate students for the geospatial technology industry which is having a growing and significant impact. A 2017 global impact study on geospatial services estimates that this industry creates approximately 4 million direct jobs and generates 400 billion U.S. dollars globally in revenue per year. The growth of this industry is increasing the demand for graduates with training in both geography and computational thinking (geo-computational thinking), but they are hard to find. The limited availability of learning pathways towards geo-computationally intensive jobs requires employers across the public and private sectors to choose between hiring a geographer with limited or no computational skills, or a computer science graduate with limited or no expertise in spatial thinking and geographic information.

This first version of the workshop was a series of invited position papers and talks from teaching and research experts in geospatial technologies from both computer science and geo-related disciplines, from both academia and industry. The workshop has attracted five position papers, one keynote speech, and one panel discussion. Total seven attendants registered for the workshop. However, the actual number of attendants were thirteen along the day, with seven to nine attendants maintained at all the times.

The workshop has achieved its goal with bringing up together experts and conducted a set of productive discussions and talks. A detailed summary of the day discussion is being prepared collaboratively by the attendants and organizers to serve as an input for the research community to follow up on the identified research gaps and opportunities, and for the following anticipated versions of the workshop.

The workshop papers and discussions have identified several grand challenges and educational research opportunities on the topics of interests. The workshop has featured an excellent keynote talk by Prof. Shashi

Shekhar from the Department of Computer Science and Engineering at the University of Minnesota - Twin Cities, where he directs the Spatial Computing Research Group. The talk was titled "*Spatial Computing Education: A Perspective*" . The talk has quickly went through the journey of Prof. Shekhar over a quarter century of spatial computing eductional activities, including in-class courses, online MOOCs, co-authoring and co-editing impactful books, articles, and encyclopedias, in addition to several members of his group who joined academia as educators in the field. Then, the talk has discussed several challenges that face spatial computing education. This included a rich set of examples for misusing language terms between different disciplines and streotypes that lead to underestimating the impact of each discipline on other disciplines with detailed examples on each. The talk finally discussed several educational models and efforts to incorporate them in spatial computing courses, discussing several behavioral, cognitive, and socio-cultural factors that affect them. A main message was the significance of learning computational thinking skills for students to be considered beyond simply programming skills to prepare for changes during their careers. The talk has triggered a very interactive discussion with several workshop attendants along the following sessions of the day.