PITTSBURGH SUPERCOMPUTING CENTER

Testimony before the Senate Community, Economic & Recreational Development Committee

October 22, 2019

Chairman Killion and Senator Williams and other members of the Community, Economic & Recreational Development Committee, thank you for the opportunity to testify before you today. I am Cheryl Begandy, Director of External Relations and Outreach at the Pittsburgh Supercomputing Center.

My testimony today will focus on the way that university research drives economic development, and the need for powerful, state of the art data centers to support that research.

But first, on behalf of the Directors and Staff of the PSC, I'd like to thank you for your ongoing support of the Center. State support is not only vital to the continued viability of the Pittsburgh Supercomputing Center and our ability to compete for Federal funding opportunities, it also provides economic return to the Commonwealth. The budget appropriations of $500,000 in each of the past five years have enabled PSC and our partners and users across the state to bring in $145 million in Federal and private foundation funding. The 4,500 jobs resulting from this funding have returned $7M in Personal Income Tax to the state as well.

State funding has also allowed the PSC to continue to develop and support K-12 STEM education and workforce development. Currently the bioinformatics curriculum developed by PSC is offered in over 15 regional high schools. The curriculum creates awareness of the field and prepares students for college level course work. We are committed to STEM programs like this, which prepare

students for 21ˢᵗ century careers, throughout the Commonwealth. Other PSC STEM programs introduce students to data science and coding.

It is no secret that university research is a key driver of economic development. In a Brookings Institute 2017 report about Pittsburgh's rise as a global innovation city, the role of academic research in fueling Pittsburgh's economic rise was the underlying theme. Fundamental and early research at the university level fills the innovation pipeline. Without those early ideas, there would be no new products, processes or companies emerging at the other end. University research is not the only factor in economic development success but it is a critical first step.

This research takes many forms – laboratory experiments, process design and prototyping, etc. But increasingly, it is happening through computation and data science. The explosion of data in all areas of life, and the accompanying development of methods to analyze and apply that data, are changing both the way research is done and the fields of study being researched. The rapid development and deployment of methods for Big Data Analytics, Artificial Intelligence, Machine Learning and Deep Learning are changing the way research is performed and creating new economic opportunities. These methods require massive data storage capacities and increased computational capabilities which need to be housed in modern state of the art data centers. In Pittsburgh, a data center to house the research computing for both Pitt and CMU along with the PSC could be a showcase for collaboration and research excellence, especially if powered by renewable energy. This is a dream scenario for many of us.

As an example of this type of research driving economic activity, Artificial Intelligence (AI) research took a big step forward when a CMU AI program overcame the world's best professional players in a series of six-player poker games. Developed at the Carnegie Mellon School of Computer Science, the *Pluribus* program runs on PSC's Bridges system. Pluribus used around 15 million core hours of computing to develop its strategies and, during live game play, used 1,400 CPU cores.

The research itself is not about poker per se, but poker as an example of an *incomplete-information game*. In such games, players have private information not available to their competitors and actively work to deceive each other. Such games are useful for AI research because they are more like real-world problems than set-piece games like chess in which players have the same information. The CMU team plans to apply Pluribus's insights far afield of poker, with promising possible uses in business negotiations, medical treatment planning and intelligence.

The principal researcher has already founded five companies, including Strategic Machine Inc. and Strategy Robot Inc.,that have exclusively licensed strategic reasoning technologies developed in his Carnegie Mellon laboratory over the last 16 years. Strategic Machine applies the technologies to poker, gaming, business and medicine, while Strategy Robot applies them to defense and intelligence. The group also received a large DOD contract of $10M.

Other examples of data-intensive research include work done at the Department of BioMedical Informatics at Pitt. Biomedical informatics covers a wide range of information types: electronic health records, genomic and proteomic data, tissue samples, imaging repositories. Michael Becich, professor and chair of the University of Pittsburgh Department of Biomedical Informatics, focuses on developing data warehouses and data mining strategies for these types of data. He currently serves as PI or Co-PI on eight funded grants, including grants from the NCI, the Department of Defense, Agency for Healthcare Research and Quality, and the PA Commonwealth Department of Health.

He believes that creating a data commons for the region for commercialization will eventually act as an attractive force for major biotech companies and pharma to cohabitate in Oakland. This cohabitation will further advance innovation in healthcare in areas such as: immuno-oncology, clinical decision support, mobile health, behavioral health, and opioid mitigation - all important areas that matter to national health and wellness.

AI-related research at CMU and bioinformatics research at Pitt are just two examples of university research that are driving economic development, especially in SW PA. They both demand access to vast amounts of data and significant computation. These in turn require high-performing data centers with state of the art data handling and computer processing. This need will only grow, not just in SW PA but across the Commonwealth.

This concludes my prepared remarks. I thank the Committee for providing me with the opportunity to appear and testify before you today. I am happy to respond to any questions you may have.