Georgia Tech is located on a 400-acre urban campus in mid-town Atlanta. It is a true global community of over 20,000 students, 6,000 faculty and staff. The university has grown double in size in the past twenty years. The growth trend is expected to follow the same trajectory in the near future. The institute’s strategic plan “Georgia Tech 2035” prominently features Georgia Tech’s commitment to build a sustainable campus from multiple aspects. This places an enormous pressure on administrators in planning, designing, building and operating the campus.

To plan for the future we need to understand the current conditions. What are we doing in this regard? What practices are in place? What practices are being developed? How will Georgia Tech look like in the year 2025 and beyond? Will it grow horizontal, vertical, or consolidate? We are seeing a paradigm shift in the higher education landscape. Will the campus of 2025 resemble the campus of today? How do we see the future and build for it? Do we need the same amount of space per student for classrooms? Or do we need technological solutions that enable student participation from wherever? How do we accommodate increased space requirements for sophisticated research undertakings? What about other support infrastructure demands? These are all common questions that many university campuses need to address and these are inherently spatial issues.

As part of the upcoming campus master plan, we are developing spatially enabled tools to visualize different scenarios and develop metrics that will allow the alternatives to be compared for the campus of the future. These tools will be used to solicit input from stakeholders at various stages of the planning process, build support for the plan and communicate the results of the planning process when the plan is finalized. The use of spatially enabled digital models and databases will allow the plan to be monitored and updated as parts of it are accomplished and to incorporate new opportunities as they arise and are added to the plan.

We expect to develop metrics on sustainability and energy use. Energy models have been developed for more than 30 buildings on campus. New constructions and major renovations have state of the art sustainable systems with sensors embedded in them. Current and future capital planning projects will have as deliverables the as-built models. These will be used as a base for facilities management and operations. We will incrementally convert the campus facilities to building models from 2D to 3D spatial models. Laser scanning of indoor spaces is
being done for newer spaces yielding accurate 3D representations of interior spaces. These new capabilities are just being formed and models will serve as the platform for future assessment of inventory, planning new initiatives, and for maintenance and operations. Developing both standards for BIM modeling and protocols for data transfer and integration with spatially enabled smart databases are critical. Real-time energy usage data gathered from across campus buildings and facilities can be displayed to stakeholders through a dashboard like platform potentially influencing to lower energy consumption.

Georgia Tech has greatly reduced its municipal water consumption during the past decade. More than 40 different water harvesting systems with a combined Cistern capacity of over 2.5 million gallons have been implemented. Harvested water is used for landscape irrigation, athletic fields, and for flushing toilets. These water harvesting systems have been mapped and integrated in to the campus spatial database for visualization. Smart sensors that monitor water inflow and outflow from the cisterns, sensors that detect leaks along irrigation channels, sensors that read weather forecasts to auto adjust irrigation schedule before rain events occur are some potential areas that would greatly enhance sustainability goal.

True to its sustainable practices, Georgia Tech recycles more than 1,300 tons of solid waste each year at a cost of well over a million dollars per year. Recycling assets of all types from large roll offs to dumpsters to small recycling containers are spread across the campus. Outside contractors are tasked to empty these containers at a fixed schedule. Perhaps smart sensors can help optimize solid waste recycling operation by triggering a demand driven service request from the contractor for a potential cost savings. Operations can be monitored through spatially enabled campus dashboard.

Parking is increasingly becoming an issue at Georgia Tech. More than 13,000 parking spaces cover the 400 acre campus with several multi-story parking decks to surface spaces. Sensor enabled parking systems that tell the campus community about available parking spaces on a specific lot and a spatially enabled dashboard application that directs someone to the space will be an ideal solution.

How to present and convince campus administration about the merits of spatially enabled campus? With shrinking budgets these days, specifically public institutions like Georgia Tech every dollar spent is looked at very closely. We need to create compelling cases to get support from administration. A simple case in point is our recent tree inventory. In alignment with its sustainability efforts, Georgia Tech has set an aggressive 50% canopy goal in its master plan. Facilities and landscape services needed a reliable tree inventory to keep track and monitor progress of canopy coverage towards stated goal. This business driver alone was not enough to get resource support from the administration for a complete inventory. In the recent past, number of trees of varying size and age has fallen around campus causing damage to property. Luckily no people were harmed in these incidents. Campus risk management wanted to know if landscape services were aware of health of fallen trees. Data was lacking to satisfactorily answer the questions. This provided an opportunity for a complete tree survey of the campus. In addition to the aesthetic beauty and canopy it provides, we wanted to quantify environmental
benefits of these trees such as carbon sequestered, rain water mitigated, and pollution removed. Storm water engineers do not adequately consider trees in their design solutions. There is a research gap at the present time. We took the opportunity to devise a spatially enabled smart database that could cater to the business needs as well as the research needs. The combined multifaceted benefits enabled us to garner support from the administration. The spatially enabled inventory database of 11,500 trees with about 42 different attributes for each tree was completed successfully last year. The inventory is being maintained continually. Georgia Tech is positioning itself as an active living and learning laboratory in this effort. We are also in the process of joining hands with US Forestry service and regional universities to develop a regional database of tree inventory that supports eco analysis and multitude of related research objectives. The tree inventory database is fast becoming a most commonly used database for planning, operations, and research purposes. We believe that this is a good example of starting small with a bigger and deeper reach. We are planning for sensor deployments on selected significant trees on campus. For us, this would be one component of a complete dashboard solution.

Resource crunch is real and it is here to stay. The new normal is doing more with less. We need innovative solutions for complex issues that face us. Platforms for building technology solutions are increasingly becoming affordable. As researchers and practitioners of geospatial technology it is our role to look out the horizon and develop frameworks, standards, specifications, procedures, and workflows to realize a spatially enabled smart campus. It is going to be enabling world of sensors and it is going to grow at unbelievably fast and has a high potential for never before seen efficiencies.

We envision scenarios where the Virtual Georgia Tech is an immersive and interactive portal that supports navigation through the campus and an open-ended range of capabilities, built up incrementally that relies heavily on spatially enabled smart platform. Time is now for smart campuses.

Georgia Tech is fortunate to attract the best and brightest students. We just need to educate them to think spatially. To enable desired solutions we need a good framework, we need sound data models and well defined procedures. It must just work.