



(Left) Ana Caceres (Ph.D. CEE and EPP) & Tania Lopez (Ph.D. CEE), *Identifying Landslide Risks in Pittsburgh*

(Right) SoA PhD student Shalini Ramesh (PhD, SoA), *The Pittsburgh Arena District Master Development Plan, 3D Energy Simulation Results*

## 48-569 and 48-781 GIS/CAFM

Kristen Kurland

A geographic information system (GIS) provides storage, retrieval, visualization, and analysis of geographically referenced data. GIS provides unique analytical tools to investigate spatial relationships, patterns, and processes of cultural, biological, demographic, economic, social, environmental, health, and other phenomena. GIS creates digital twins (virtual representations) of natural and built environments and uniquely integrates many types of digital models including CAD, BIM, and CAFM.

Computer Aided Facilities Management (CAFM) and Integrated Work Management (IWMS) technologies streamline facility operations, boost productivity, and develop strategic planning goals for an organization. Facility and infrastructure management technologies improve the integration of the physical workplace with the people and work of an organization.

The course includes in-person and asynchronous video lectures to learn important GIS concepts. Software tutorials and in-person/remote technical sessions cover leading GIS software from Esri Inc. Applications include ArcGIS Pro, ArcGIS Online, ArcGIS Map Viewer, ArcGIS Story Maps, and Dashboards. CAFM/IWMS software will be reviewed.

Subject areas related to architecture, engineering, construction management, building performance, sustainability, public policy, urban design, and planning include:

- *Geographic concepts* (world coordinate systems, map scale/projections, elevation),
- *Government-provided map infrastructure* (TIGER maps, census data, satellite and aerial photo images, local government data, cadastral maps),
- *Map design* (cartographic principles, interactive maps, map animations, and Web-based GIS),
- *Geodatabases* (importing spatial and attribute data, geocodes, table joins, data aggregation, and map queries),
- *Creation of new spatial data* (digitizing, integrating BIM and GIS, and geocoding vector features),
- *Spatial data processing* (clipping, merging, appending, joining, dissolving),
- *Spatial analysis* (proximity analysis, risk surface, site suitability, spatial data mining),
- *Macros and tasks* (form-based tools, flowchart-based design, user interface),
- *3D GIS* (3D surface modeling, draping/extruding features, fly throughs, line-of-sight analysis, procedural rules),
- *Raster GIS* (hill shade, kernel density estimation, risk index modeling, raster queries),
- *Spatial Statistics* (space time pattern mining, spatial regression, hot spot analysis)
- *Data mining and cluster analysis* (multivariate analysis of large data sets),
- *Network analysis* (traveling salesman problem, multi-vehicle routing problem, facility and site selection), and
- *GIS Dashboards* (interactive dashboards for daily operations)
- *Space, Asset Management, Building Operations, Emergency Preparedness, Environmental Health and Safety, and Real Property and Lease Management*