ARCH 4050/6303 / Urban Analytics: Engaging Urban Futures
School of Architecture / Center City Campus (C3)
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Facing Uncertainty
Humans have continuously contemplated the future and speculated about how changes might unfold, particularly in areas over which they have little control. For several decades, urban planners and designers, tasked to help envision the future, have recognized the need to prepare for future community needs and challenges through structured planning activities with a hope that the future can somehow be created following planned investments and fall within reasonable expectations. However, a city's future remains uncertain. The number of factors that influence whether changes occur and to what extent they take place is enormous. Moreover, past trends and the knowledge learned from historical events may not necessarily be the direction communities wish to head. To deal with uncertainty embedded in the processes of building our urban futures, this course is aimed to explore these following planning/design methods and techniques in order for urban planners, designers, and architects to "see" the possible outcomes of urban development:

1. **Scenario Planning**

Scenario planning is one of the methods enabling architects and urban designers to engage citizens in the process of planning and design. It allows participants in public meetings to develop a range of possible design solutions that may lead to alternative future conditions. By examining the pros and cons of these scenarios against a set of measures, a preferred design scenario may emerge to become the selected solution. This type of citizen participation has its root in participatory design, which sees community members as citizen designers who play an active role in shaping the formulation of both the design process and its results. Scenario planning typically utilizes mapping software, such as Geographic Information System (GIS), to manage data and provide contextual information about a community. It then relies on a unique user interface to enable painting on the map generated by the software to brainstorm ideas for possible improvements in the community.

2. **Immersive Visualization Technologies**

Immersive technologies, such as Virtual reality (VR), create immersive experiences with a perception of being physically present in a non-physical world. GIS can greatly enhance the accuracy and realism of virtual scenes with up-to-date terrain models and geographically referenced 3D features. VR creates an artificial world where a user can interact and reach out to various virtual objects through a headset with specialized software and sensors. Augmented reality (AR), on the other hand, through mobile devices or smart glasses, takes a user's view of the real world and superimposes virtual objects onto the physical environment.

The overarching goals of the course are as the following:

- Develop an understanding of scenario planning and its associated geographic data organization and mapping techniques in GIS
- Develop the operational skills to create 3D GIS models
- Develop linkages between GIS's capabilities and the immersive visualization technologies, such as VR/AR through game software engines, such as Unity.

Course Structure
The course is structured around paired lectures and lab sessions. Topics introduced in discussion sessions will be explored in greater depth and applied to real data during lab sessions. In addition, students are expected to work on an individual project (or a team project with classmates) to apply spatial analysis and 3D modeling and visualize future urban development through VR/AR platforms.

Software Programs
Esri ArcGIS Desktop; Esri ArcGIS Pro; Esri ArcGIS Online; Esri ArcGIS CityEngine; Unity