**Abstract**:

Visual localization is the problem of estimating the exact position and orientation from which an image was taken in a known scene. Visual localization is a core component of many important applications such as self-driving cars and other autonomous robots, as well as Augmented and Mixed Reality systems. In practice, visual localization algorithms need to robustly and reliably operate in a wide range of conditions that can differ drastically from the condition under which the scene was initially recorded. Hard condition changes include day-night as well as seasonal changes.

This talk will focus on semantic visual localization in changing environments. The underlying idea is that while the appearance of a scene can change drastically over time, the semantic meaning of many scene elements remains the same, e.g., a tree remains a tree independent on weather, illumination, or seasonal changes. After discussing recent benchmarks suitable for measuring localization performance under changing conditions, the talk will detail how semantic scene understanding can be used in different parts of a visual localization pipeline, from feature descriptors to pose estimation and verification. The underlying assumption of these approaches is that semantic image segmentations can be computed reliably independent of imaging conditions. Since this assumption is often not valid in practice, I will also talk about how visual localization and 3D reconstruction techniques can be used to generate
weakly labelled training data for semantic segmentation.