



## **Stereo matching and reconstruction**

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### **Abstract**

Stereo matching enables us to take collections of photos and build highly detailed 3D reconstructions of surface geometry. In this tutorial, we start with the basics of stereo correspondence, namely representations of volumetric photoconsistency and its efficient computation using plane sweep algorithms. Next, we discuss various optimization algorithms, including window-based winner-take-all, which can be implemented on GPUs for real-time performance, and global optimization approaches such as dynamic programming, MRFs, and segmentation-based aggregation. In the second half of this tutorial, we describe multi-view techniques for reconstructing full 3D volumetric and surface-based representations. We also present techniques for specialized domains such as architecture, which can exploit higher-level constraints such as co-planarity and orthogonality.

Note: Marc Pollefeys will teach the first half of the course (plane sweep and optimization), while Richard Szeliski will teach the second half (3D modeling).

*Syllabus: photoconsistency, disparity space, plane sweep, optimization techniques, surface models, range data integration, higher-level primitives and structural constraints*