



CSCI 5563: 3D Computer Vision

HYUN SOO PARK

Computer Vision: Understanding Image



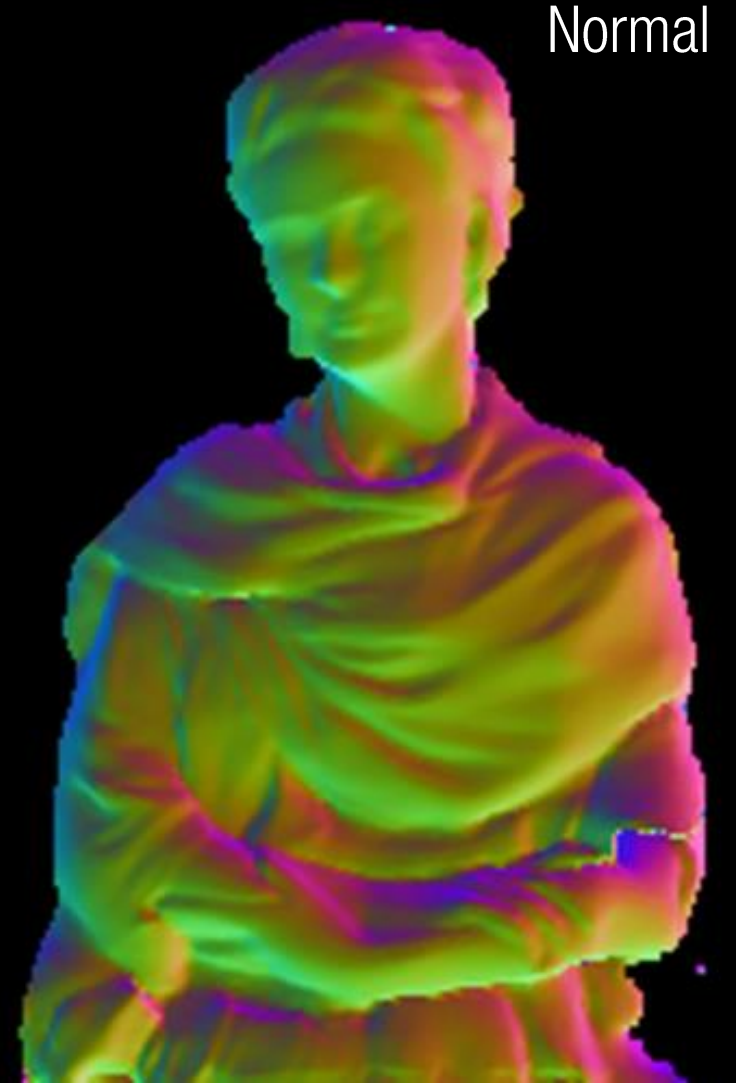
- Who is she?
- How does she strike a pose?
- Is she smiling?
- Where was the camera?
- How far is she?
- Where was the light?

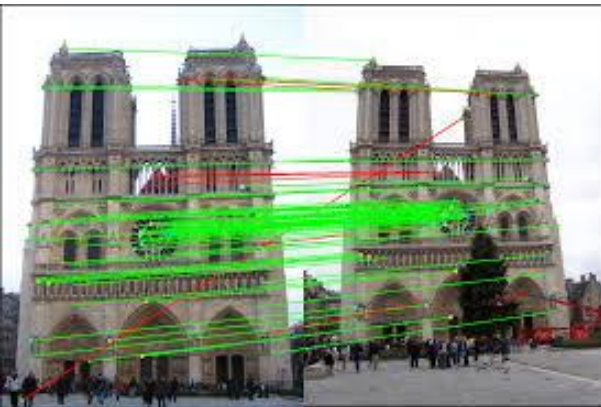
3D Computer Vision: Understanding Geometry of Image



- Who is she?
- How does she strike a pose?
- Is she smiling?
- Where was the camera?
- How far is she?
- Where was the light?

3D Computer Vision: Understanding Geometry of Image



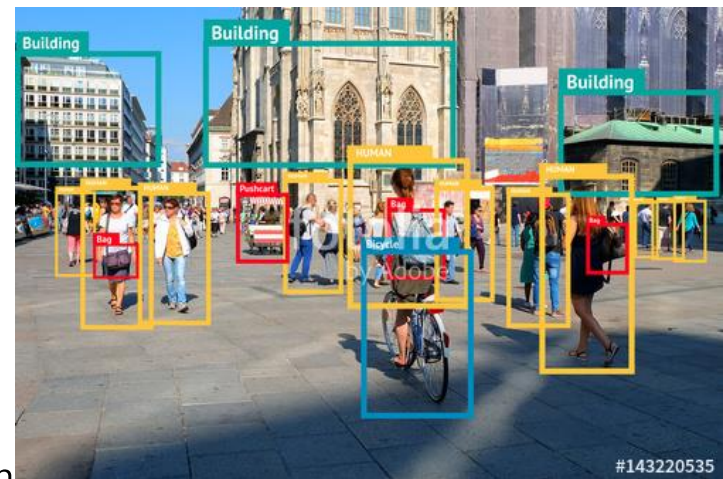


Registration

Recognition

Tracking
Alignment
Matching

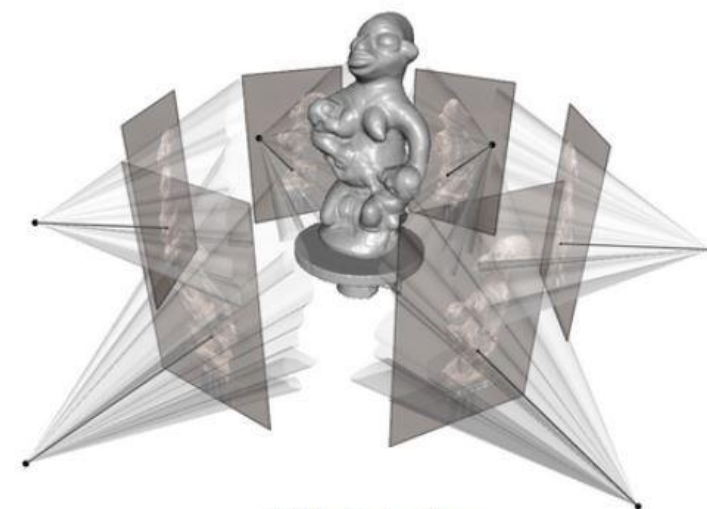
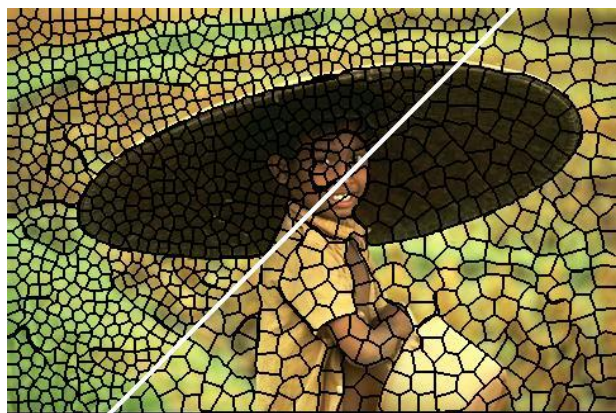
Detection
Localization



Segmentation

Reorganization

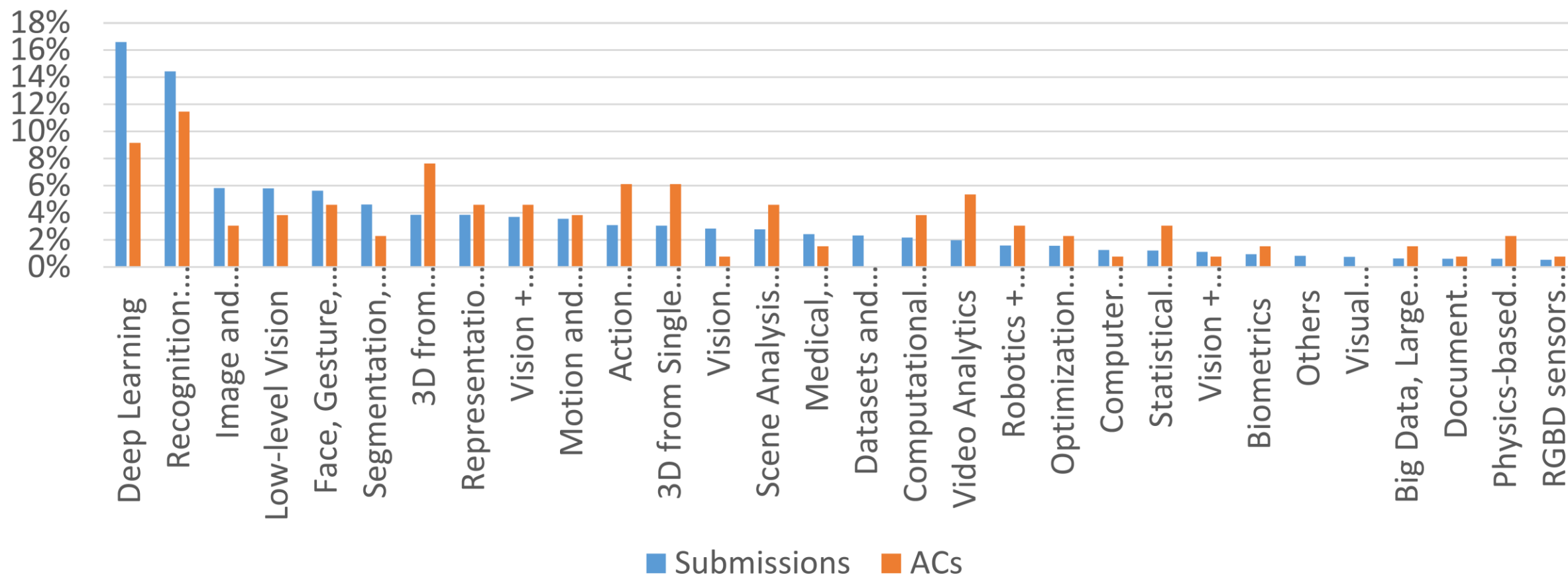
Reconstruction



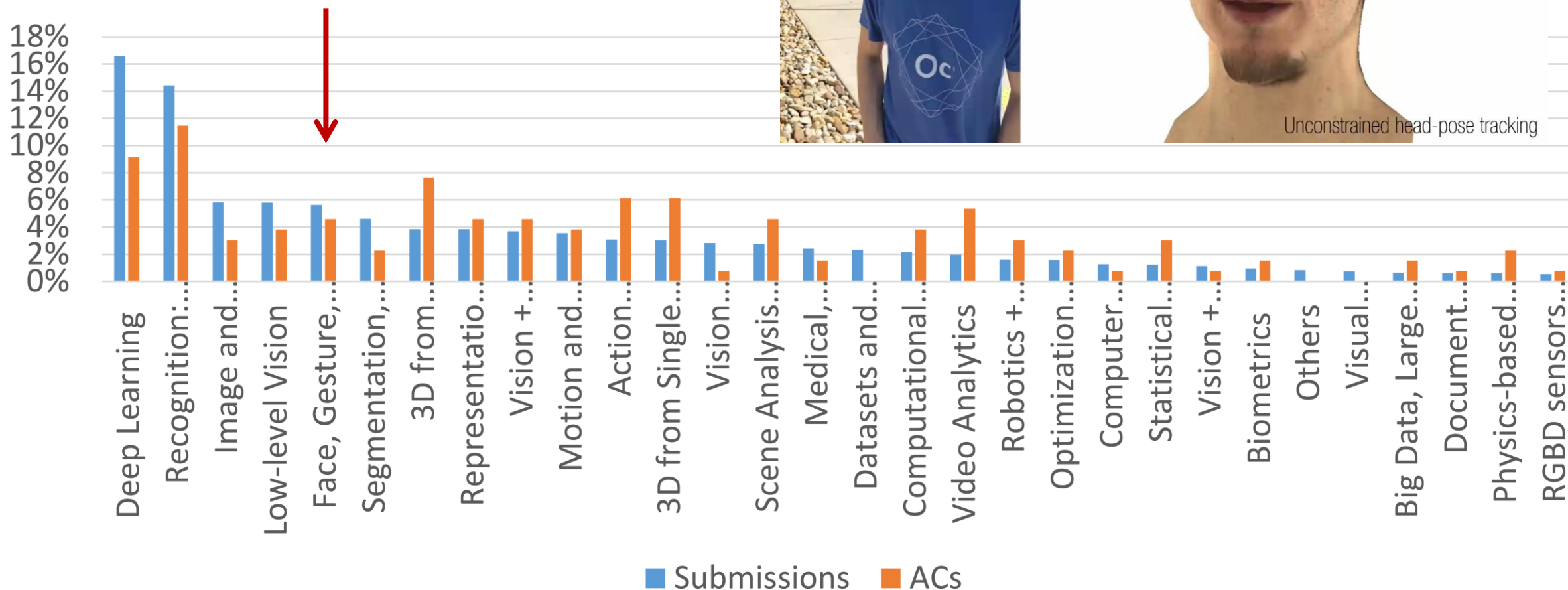
3D Reconstruction

Computer Vision

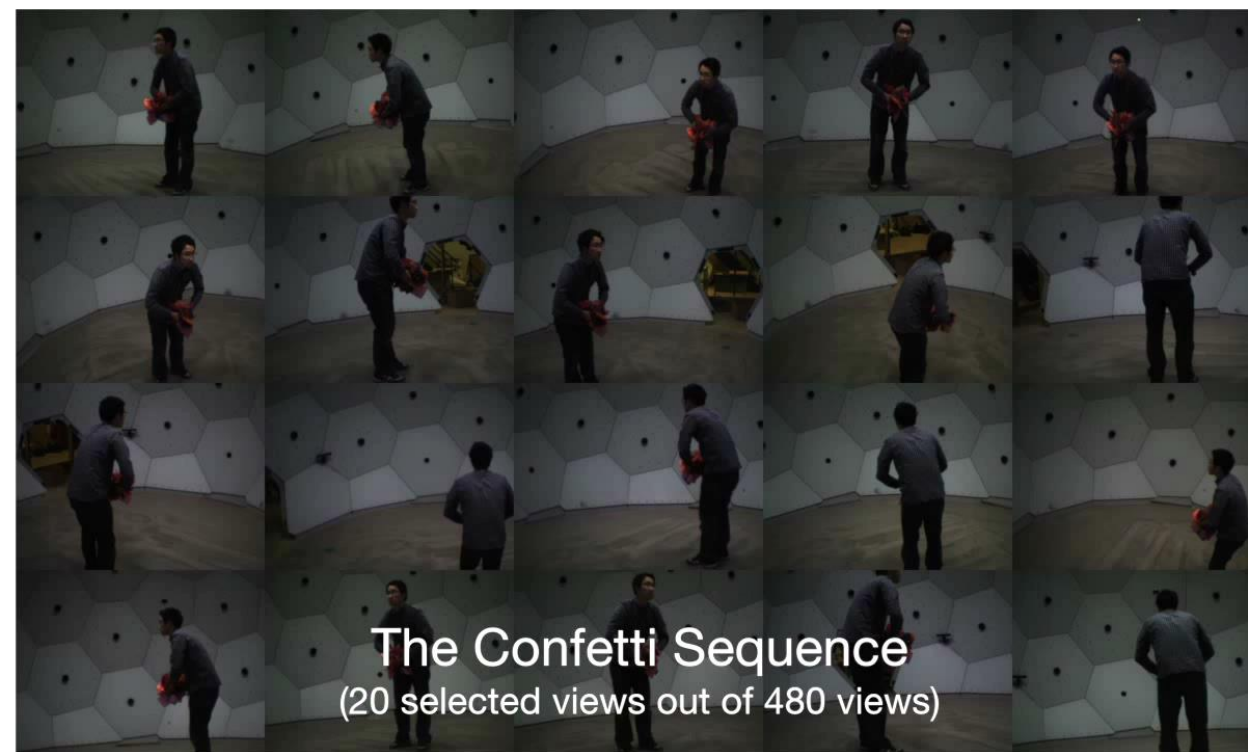
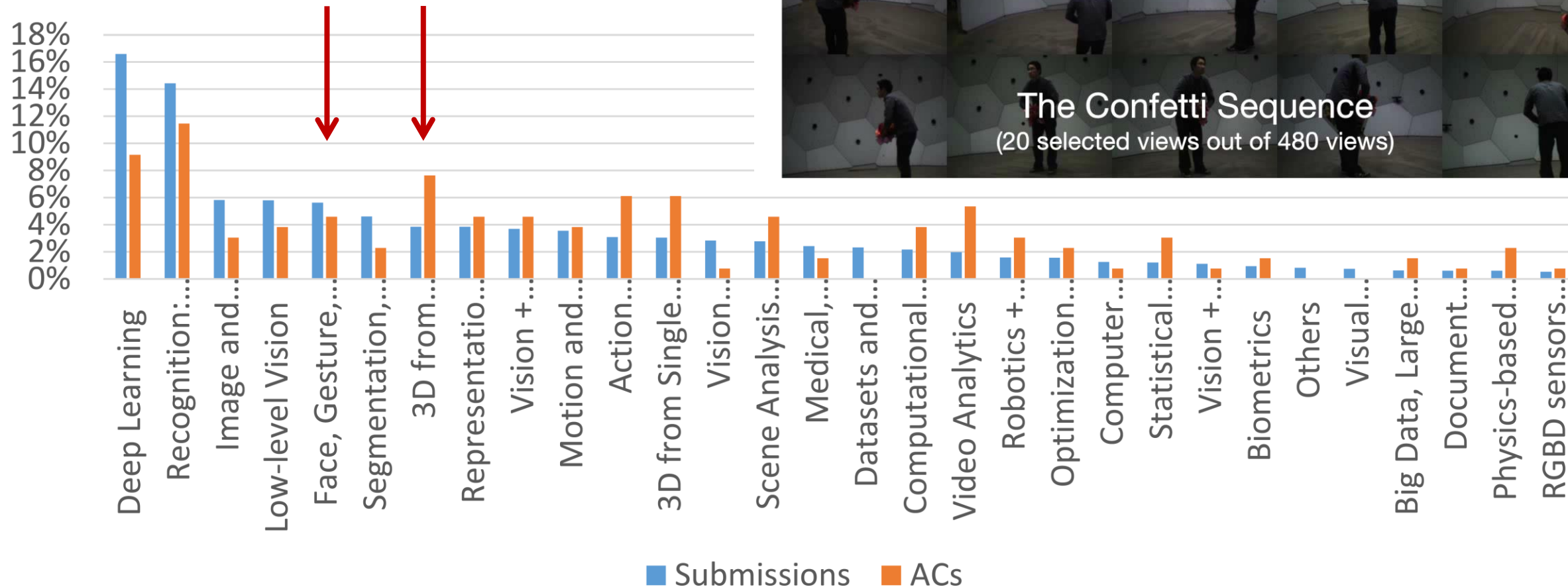
3D Computer Vision Area



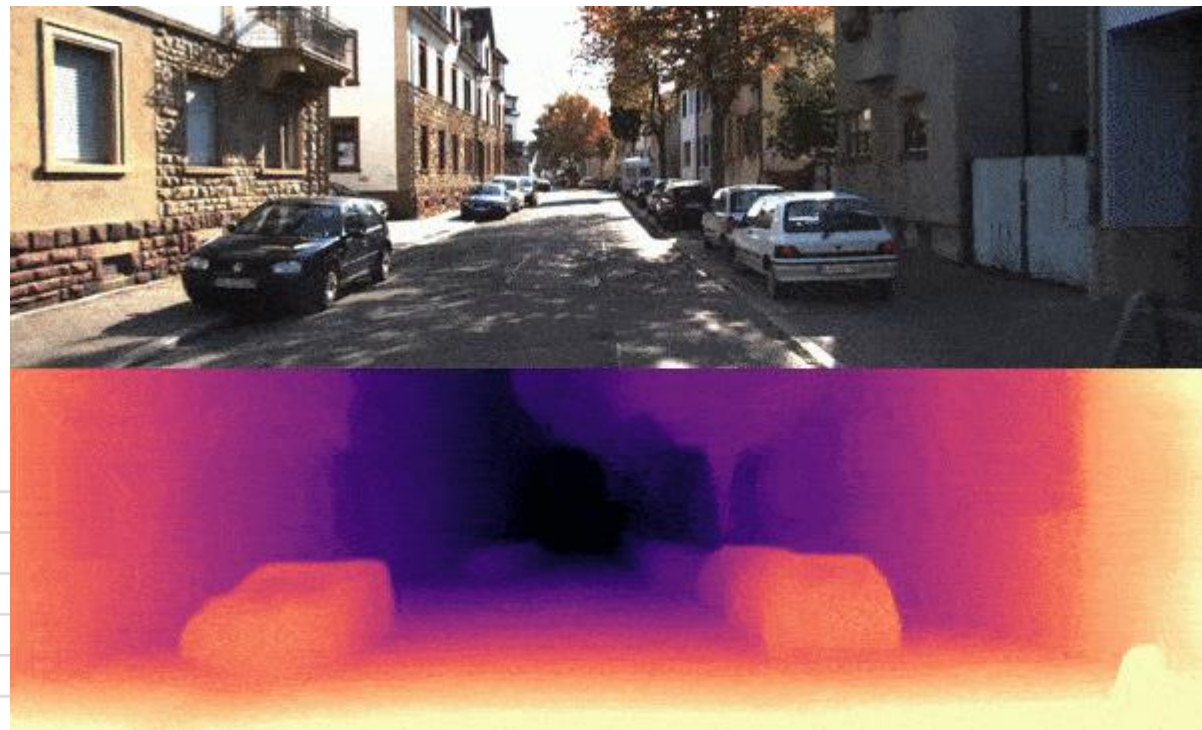
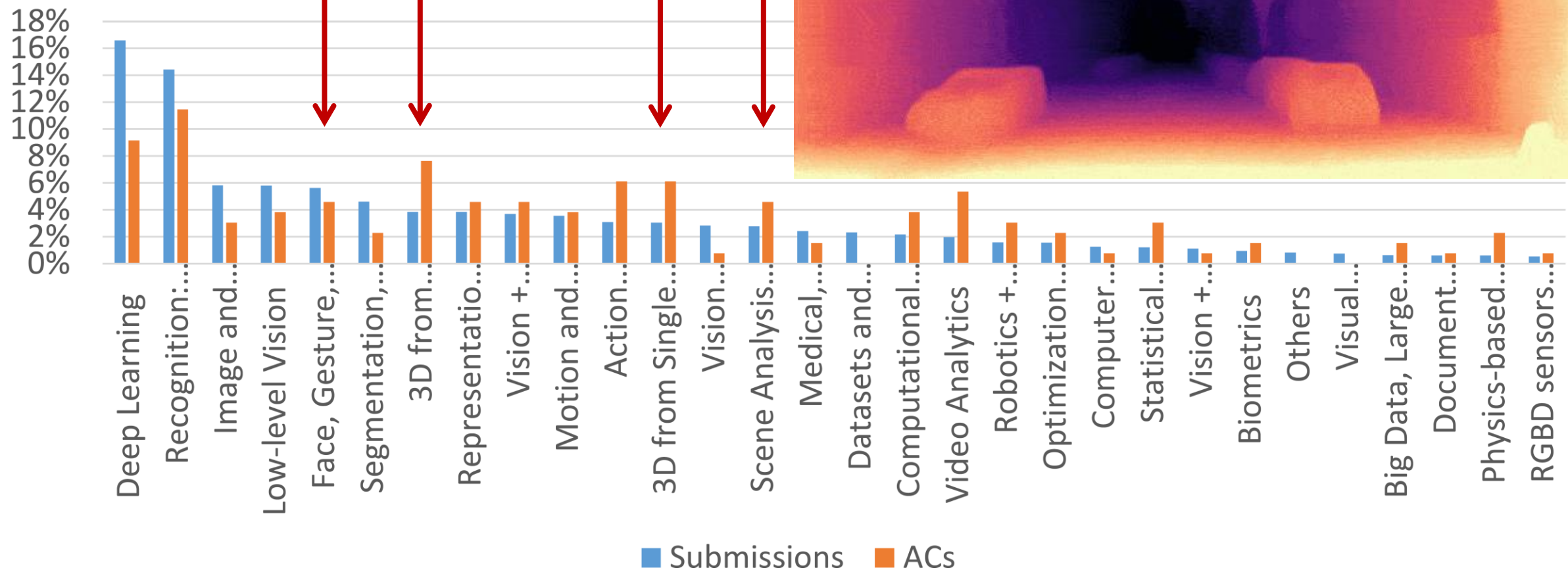
3D Computer Vision Area



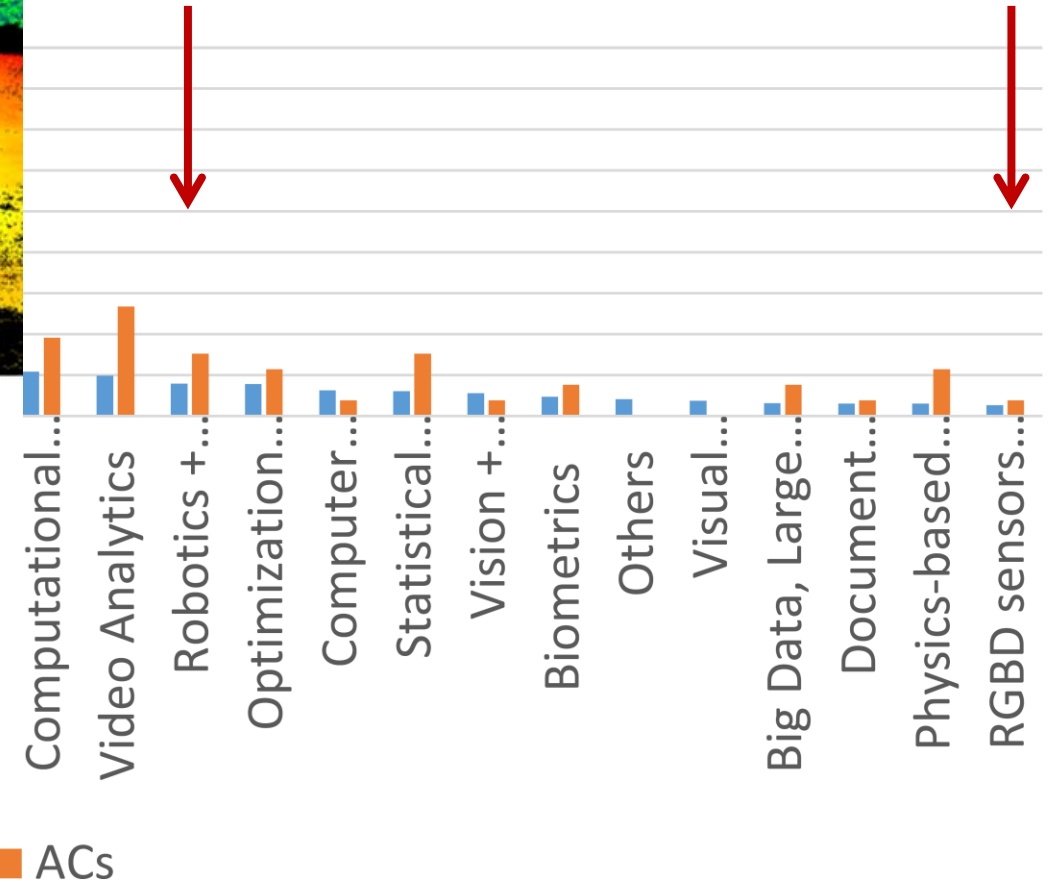
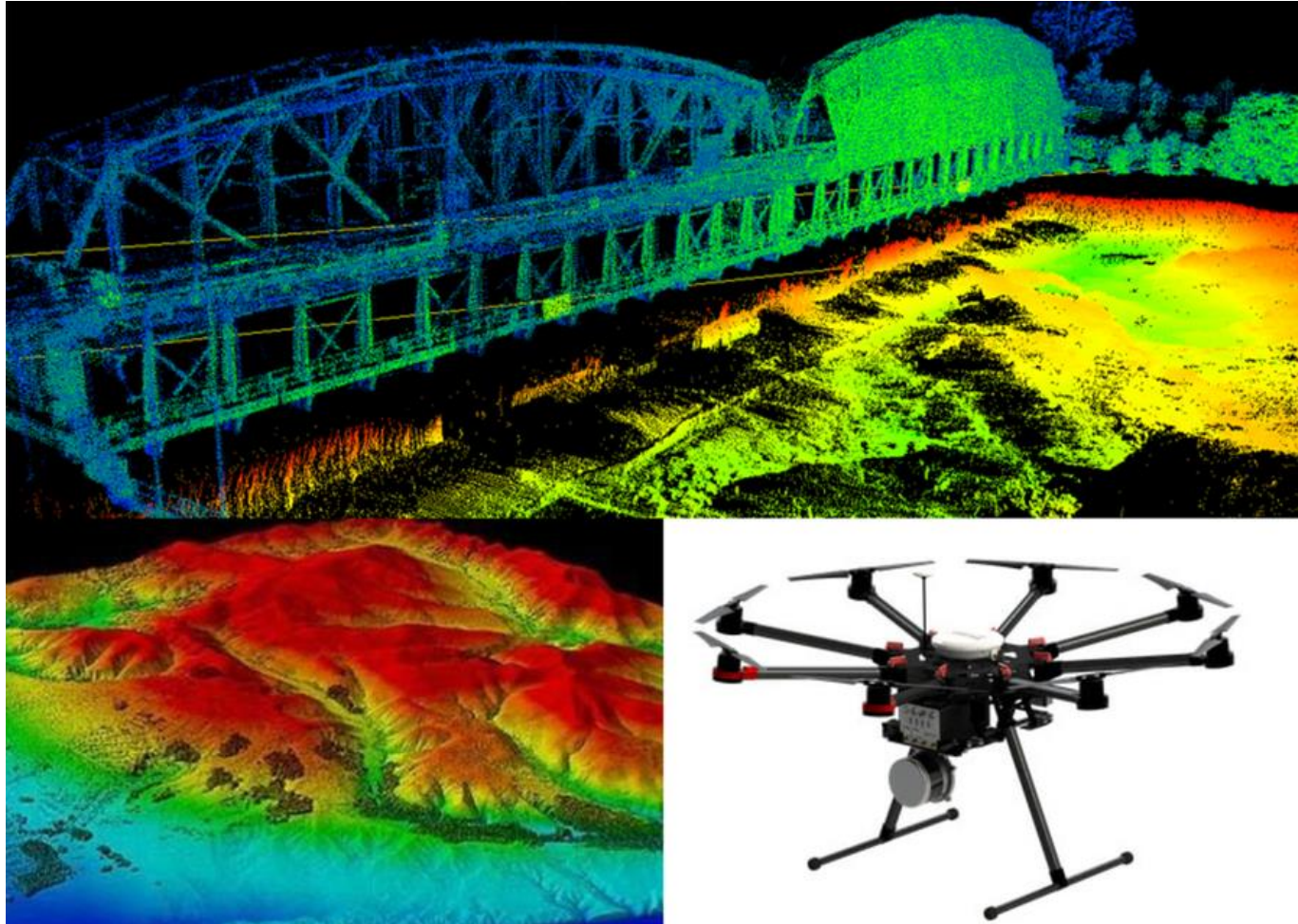
3D Computer Vision Area



3D Computer Vision Area



3D Computer Vision Area



Movie

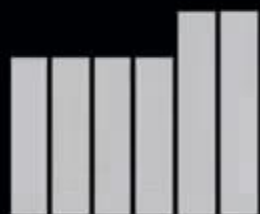
Raw Bullet Time Footage



cinefex

Graphics





THE MAKING OF

CHEMICAL BROTHERS 'WIDE OPEN'

VR/AR



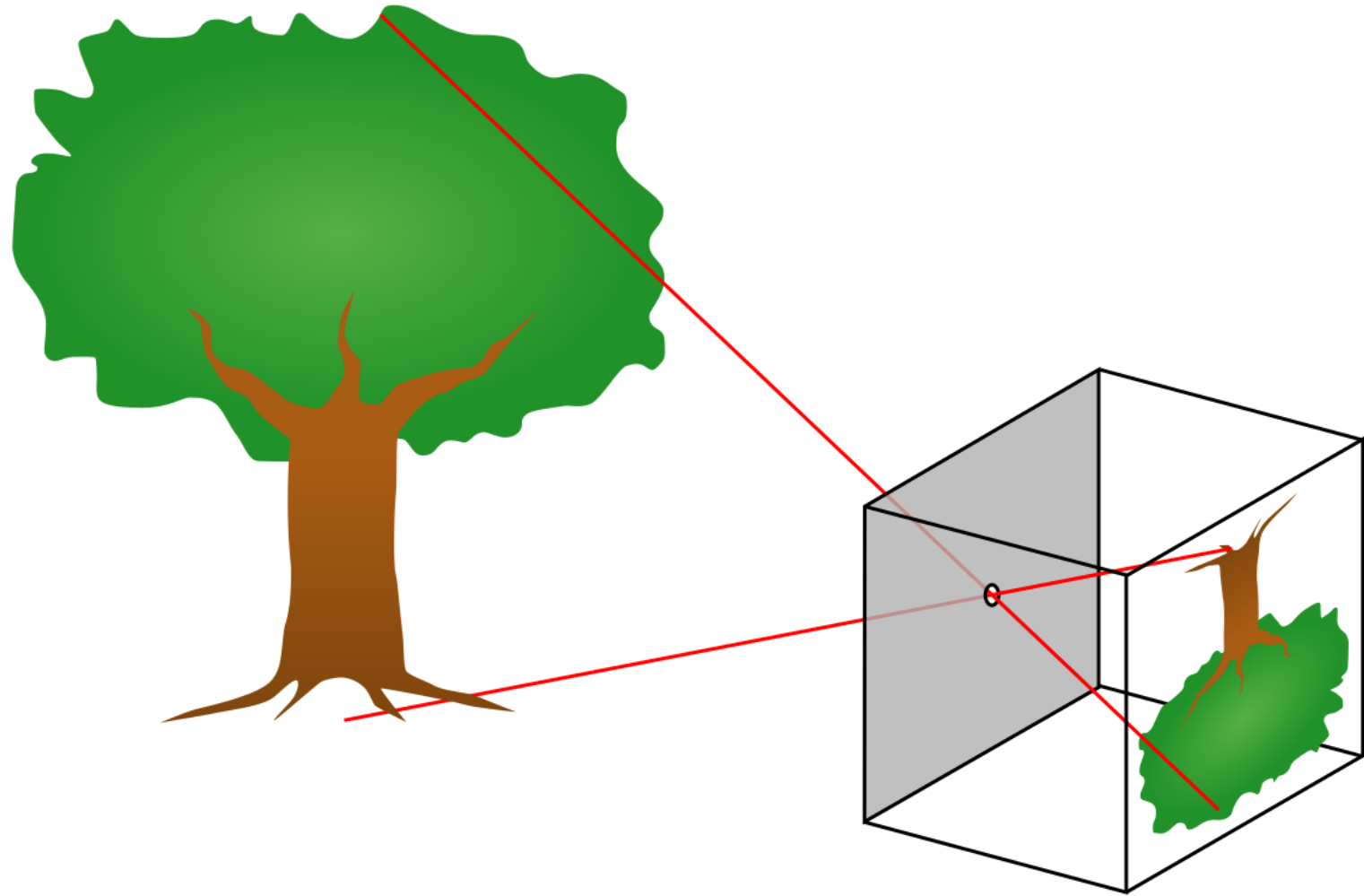
Facebook Reality Lab

Multiview image streams

WHAT WILL BE COVERED?

Topic I: Camera Geometry

- Camera model
- Projection matrix
- Projective geometry



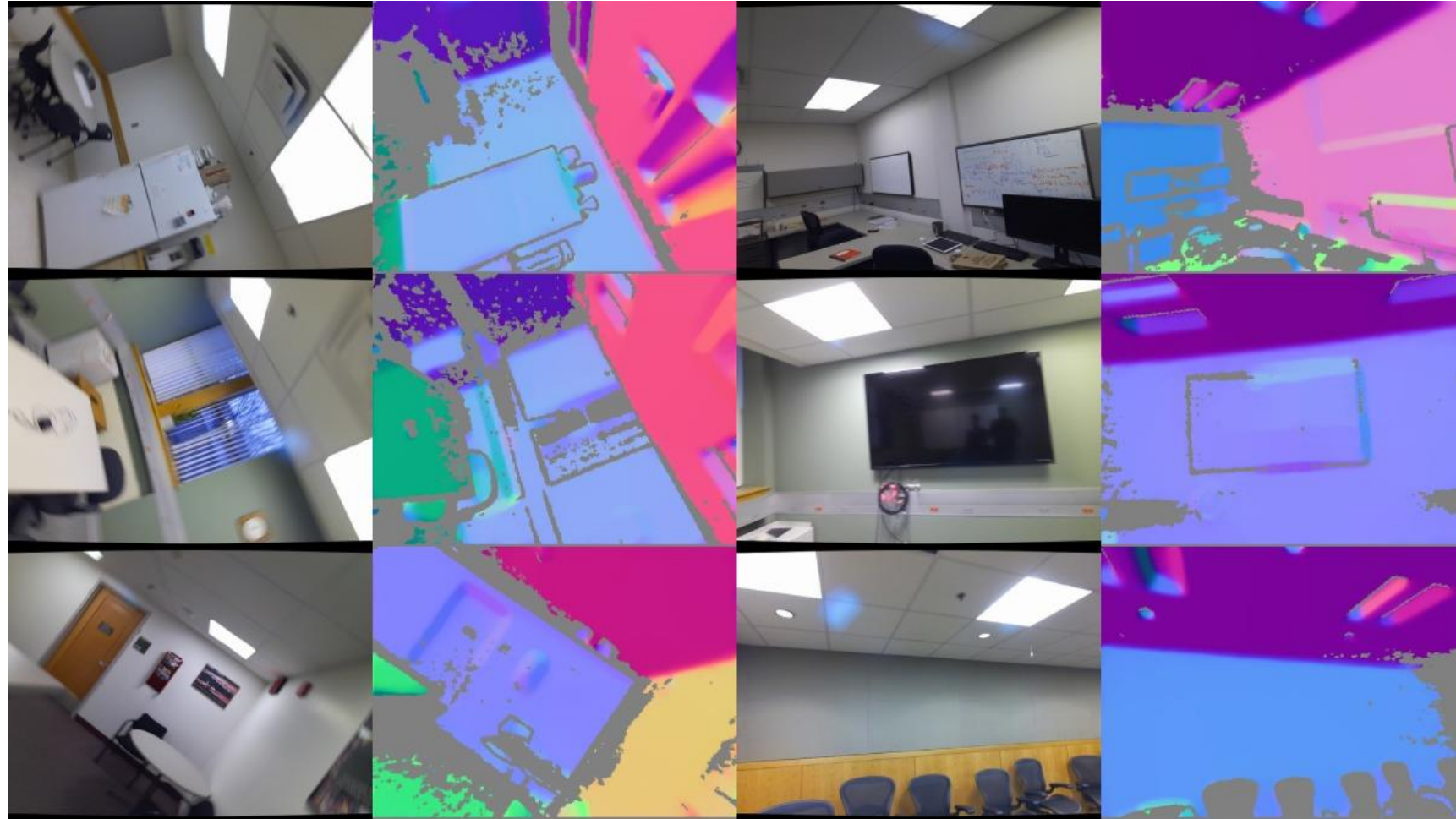
Topic II: Transformations

- Image transformation
- Homography
- Spatial rotation



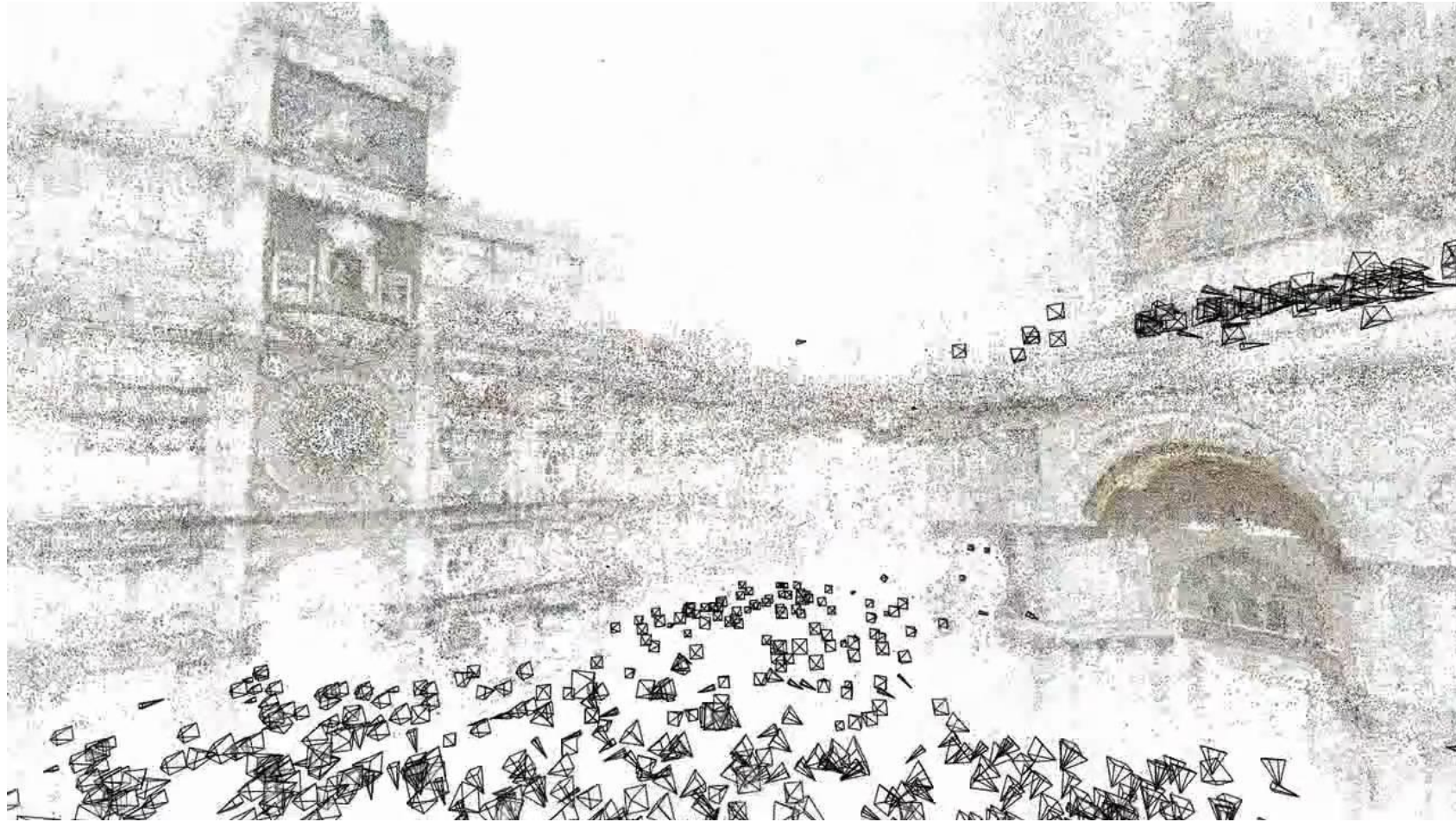
Topic III: Learning based Geometry

- Deep learning
- Depth prediction
- Surface normal prediction



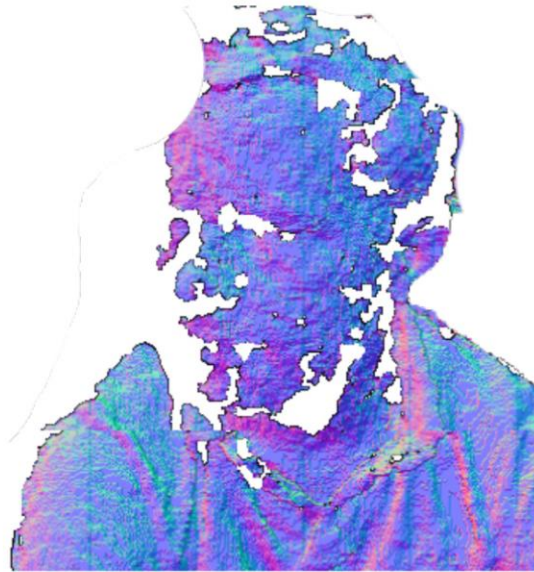
Topic IV: Epipolar Geometry

- Epipolar geometry
- Fundamental matrix
- Pose estimation
- Triangulation
- Bundle adjustment



Topic V: Depth Fusion

- Functional scene representation
- Iterative closest point algorithm
- Depth fusion



WHAT WILL NOT BE COVERED?

WHAT WILL NOT BE COVERED?

- Basic Machine Learning knowledge
- Python programming
- Linear algebra / Calculus
- Basic computer vision knowledge (take 5561)

EVALUATION

- 5 programming assignments (15% each)
 - Late submission: 20% off from each extra late day
- Project (up to two students) (25%)
 - Project proposal presentation 5%
 - Written project proposal 5% (3 pages)
 - Final project presentation 10%
 - Written final report 5% (6 pages)

No make-up assignment

COURSE WEBSITE

https://www-users.cs.umn.edu/~hspark/csci5563_S2021/csci5563.html

Spring 2021 CSCI 5563
3D Computer Vision

Information

[Syllabus](#)

Instructor: [Hyun Soo Park](#) (hspark at umn.edu)
Office hour: Wed 2:00pm-3:00pm (Zoom)

TA: Jingfan Guo (guo00109 at umn.edu), Tien Do (doxxx104 at umn.edu)
Office hour: Mon/Tue/Thr 2:00pm-3:00pm (Zoom)

Teaching mode: online

Textbook: Not required but the following books will be frequently referred:
+ "Multiple View Geometry in Computer Vision", Hartley and Zisserman

Important Dates

HW #1 due: Feb 5 midnight

- Syllabus
- Schedule
- Lecture slide
- Homework