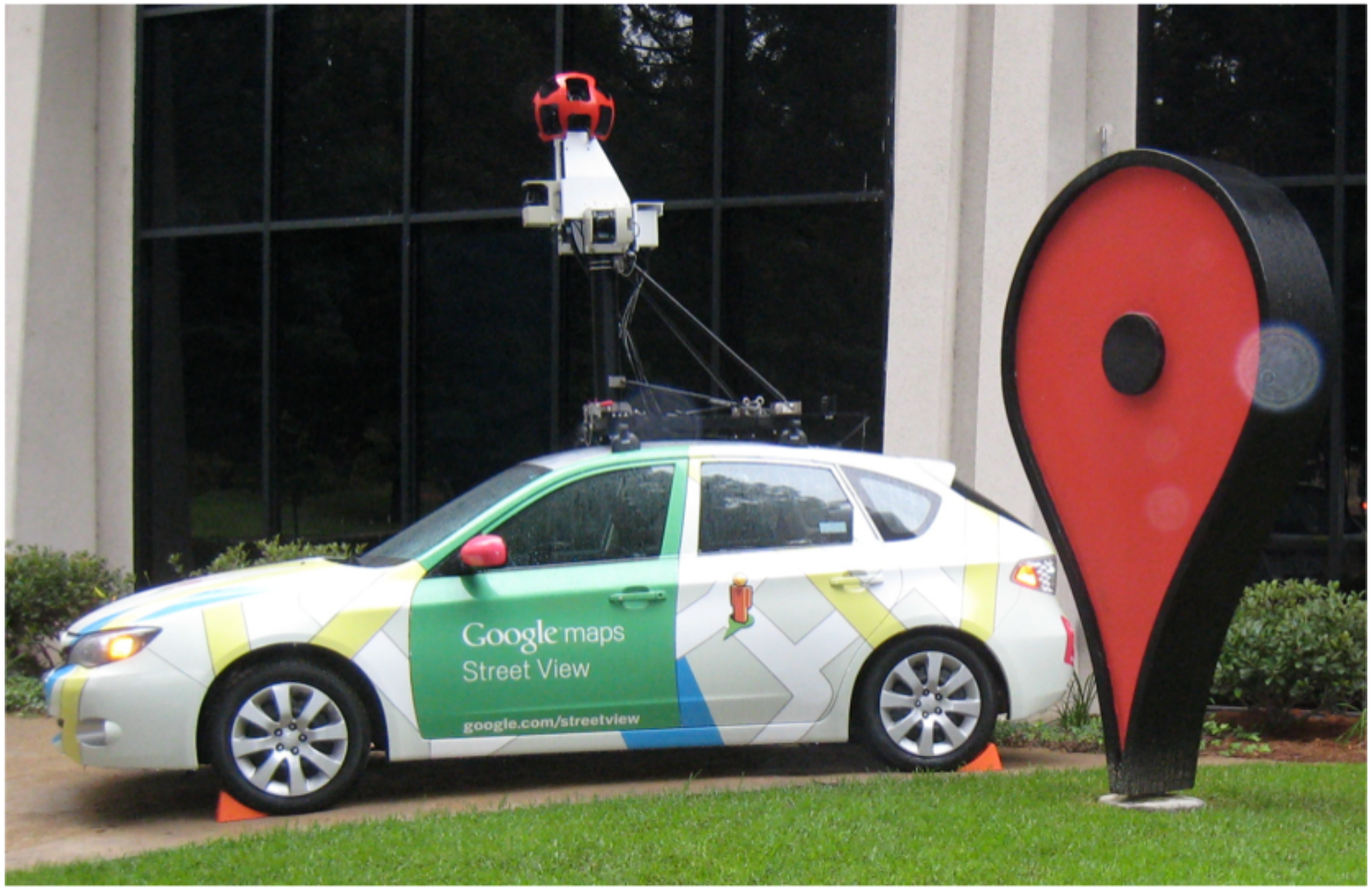
CS 6501 – Large-scale Data-driven Graphics and Vision

Fall 2015

Connelly Barnes

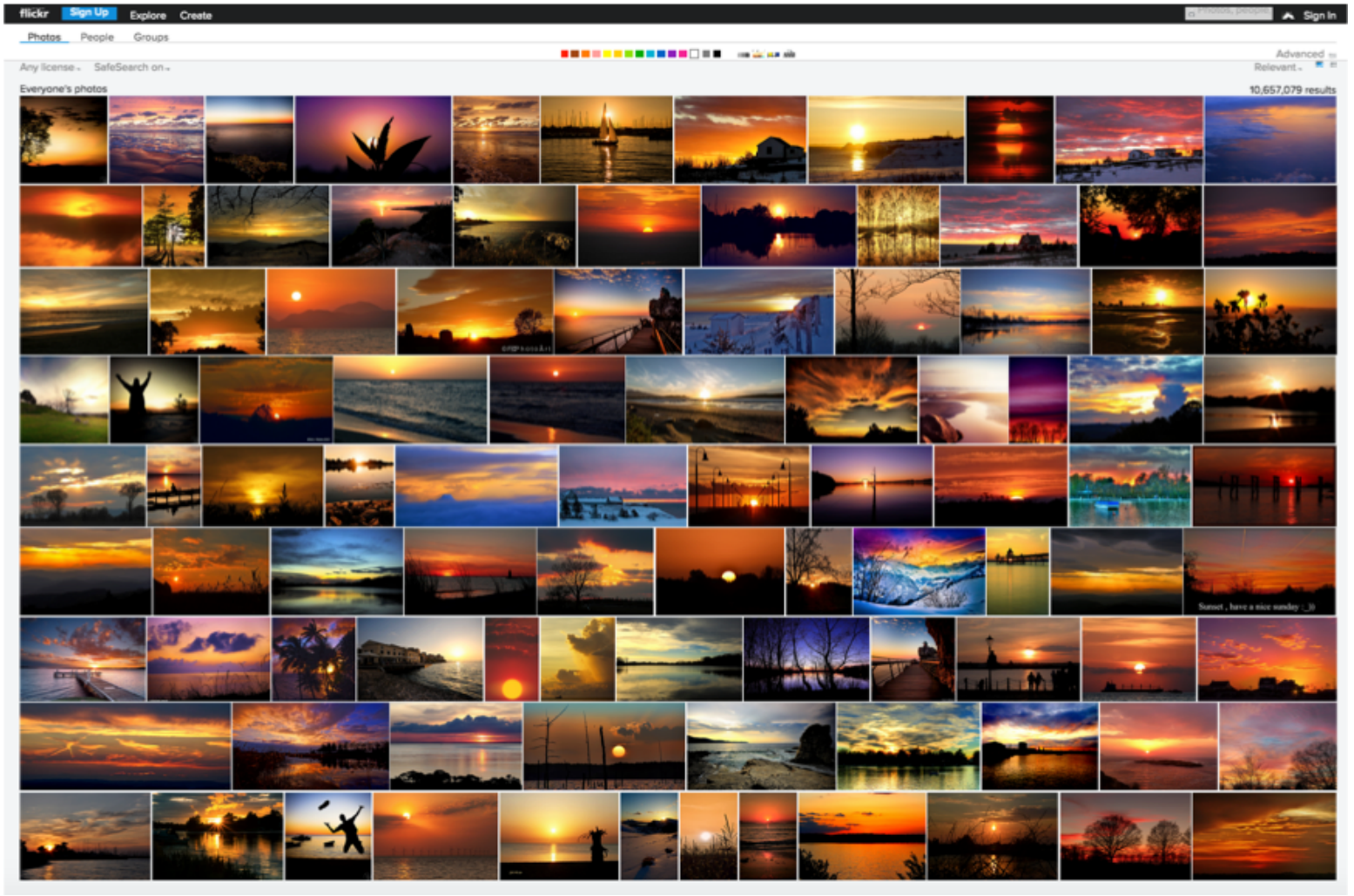
Big Visual Data

- Billions of photos: Google street view



Big Visual Data

- Billions of photos: Flickr

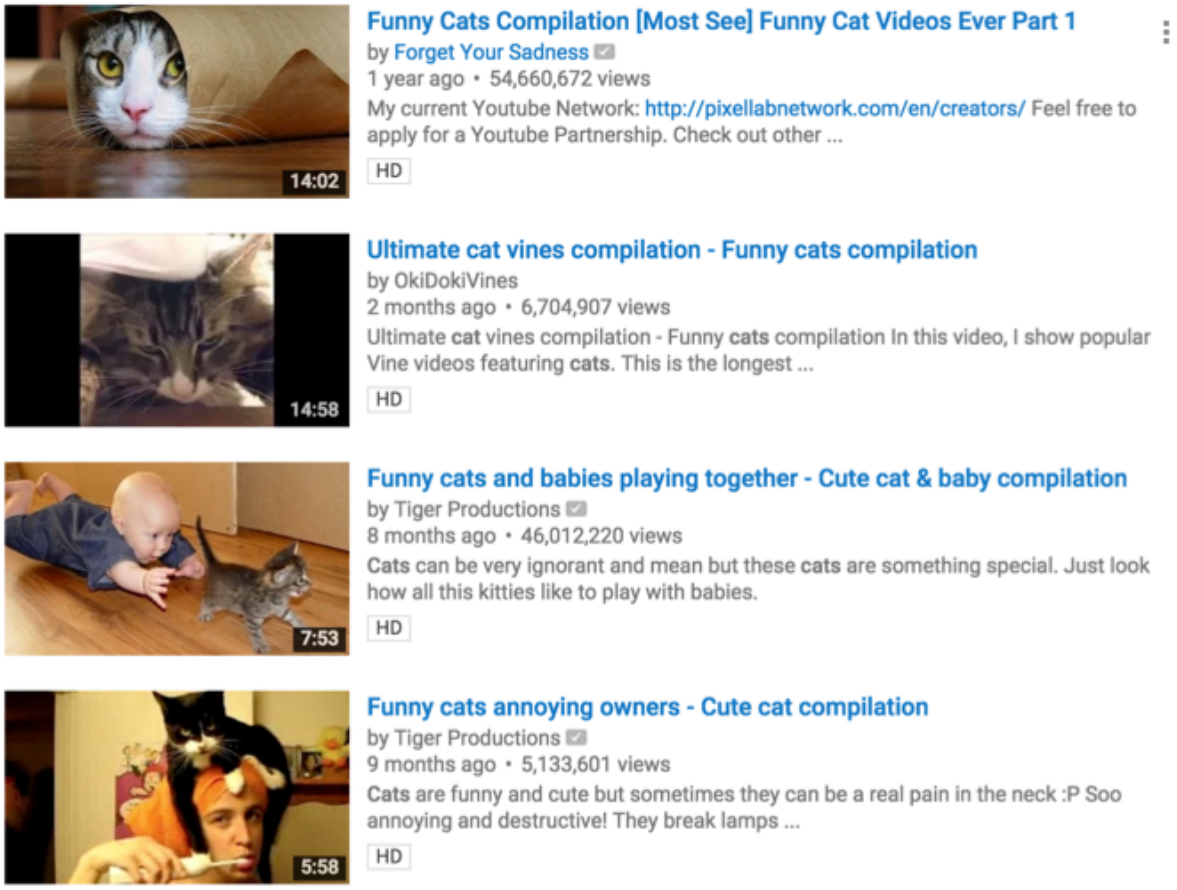


Big Visual Data

- Billions of photos: Facebook

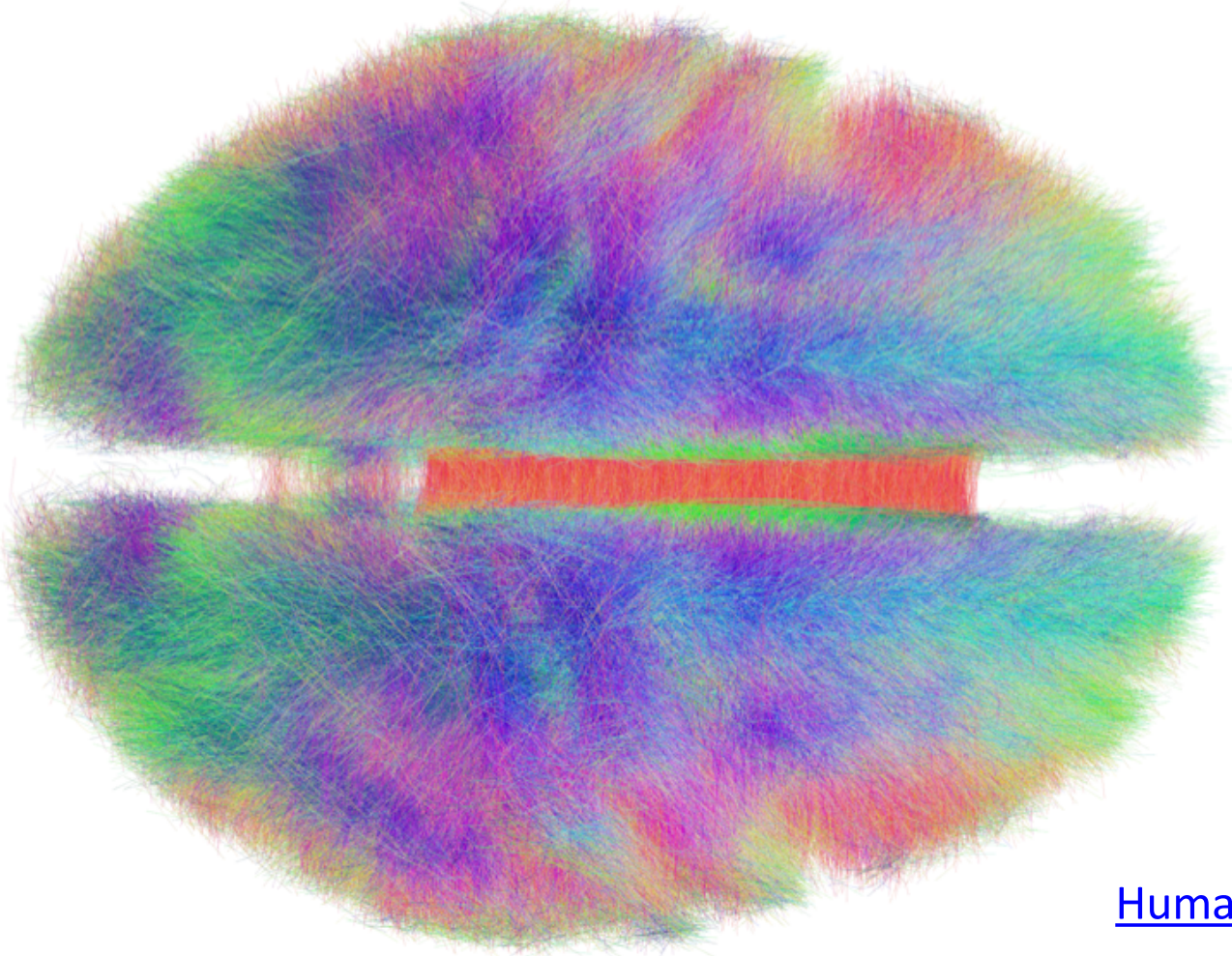
Big Visual Data

- Billions of videos: YouTube
- 25 million cat videos



Big Visual Data

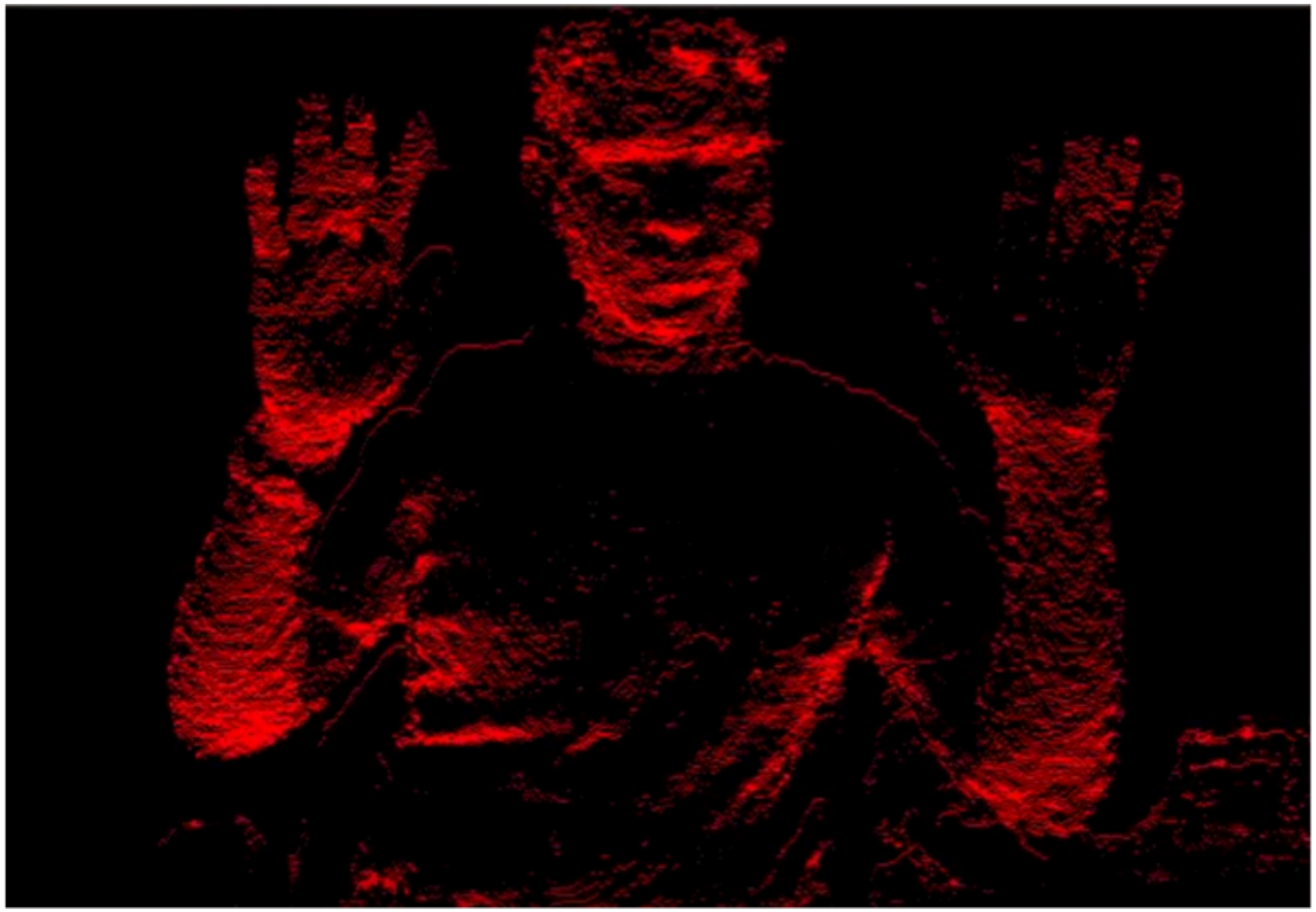
- Medical imaging: photos or volumetric data



Human Connectome

Big Visual Data

- New sensors: depth (Kinect), stereo cameras



Kinect depth video

Big Visual Data

- New displays: VR headsets (Oculus Rift, Microsoft Hololens)

Microsoft Hololens video

Big Visual Data

- Autonomous devices: cars, quadcopters

DJI Phantom 3 video

Problems

- How do we gain insights from the visual data?
- How do we process all the data efficiently?
  - Real time processing?
  - Minimize network bandwidth?

- Computer graphics: model with precision, display, edit, visualize
- Computer vision: model probabilistically, infer meaning, categories, find correspondences

Topics

- Computer vision and imaging basics
- Deep learning for X
  - Segmentation, classification, facial recognition, feature extraction, visualization
- Photo collections
  - Finding correspondences, enhancement, editing, visualization
- Images with Depth

Topics

- Going 3D
  - Structure from motion, city reconstruction, scene-space processing
- Cars
  - Road, trajectory estimation, object detection, DARPA challenges
- TBD. Medical imaging? Connectomics?

Course Website

- http://www.connellybarnes.com/work/class/2015/large_scale/

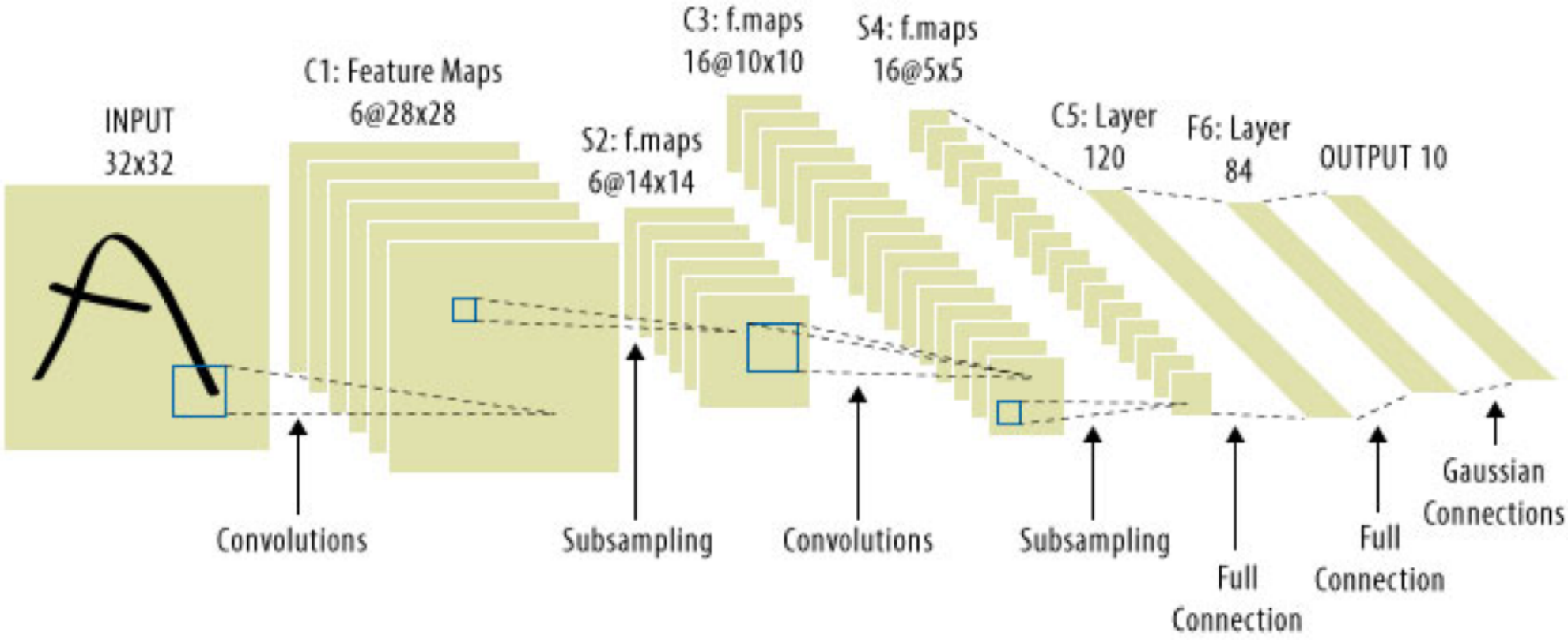
- Other ways to find the website:
  - Linked to from UVa Collab
  - Linked to from Lou's list
  - Linked to from my website connellybarnes.com

Grading

- Quizzes in class (15%)
- Student paper presentations (20%)
  - Sign up for two presentations here: **http://tinyurl.com/otjeqv2**
- Programming assignments (35%)
- Final course project (30%)

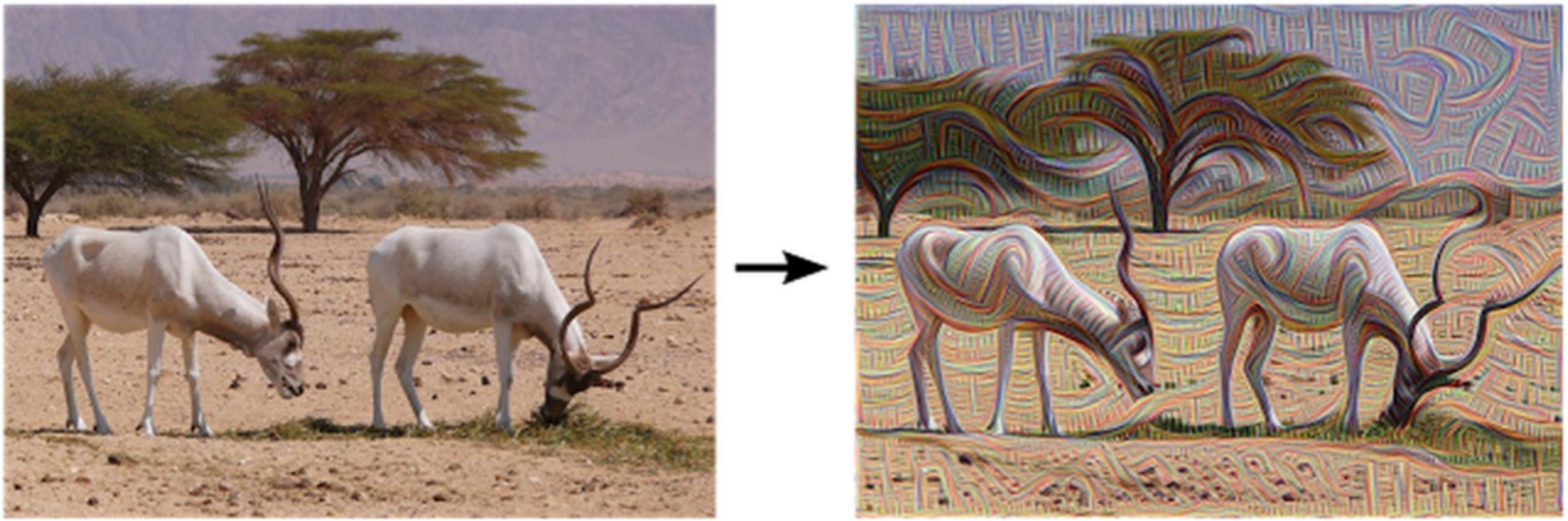
Sampling of Course Topics

- Convolutional Neural Networks



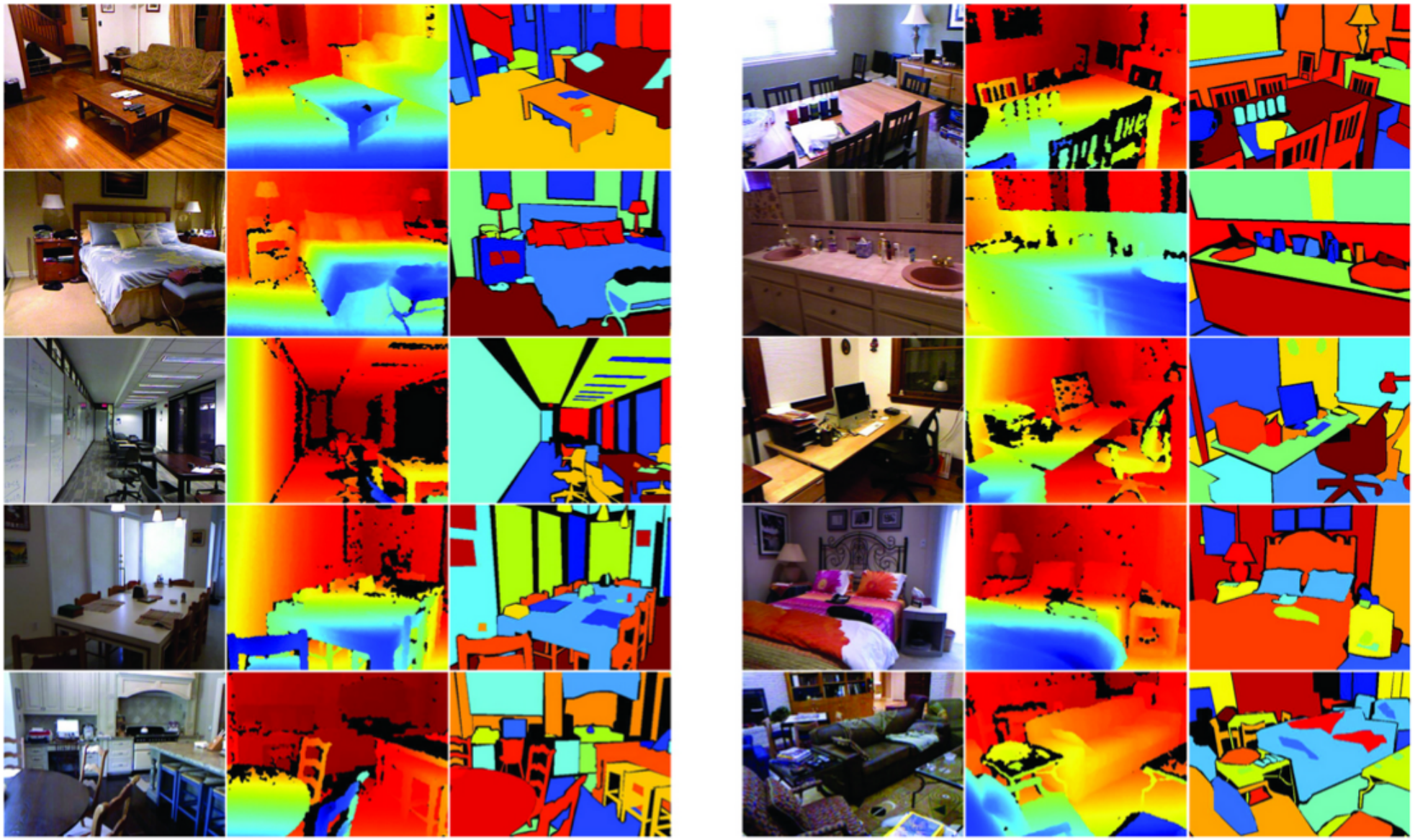
Sampling of Course Topics

- Google Deep Dream



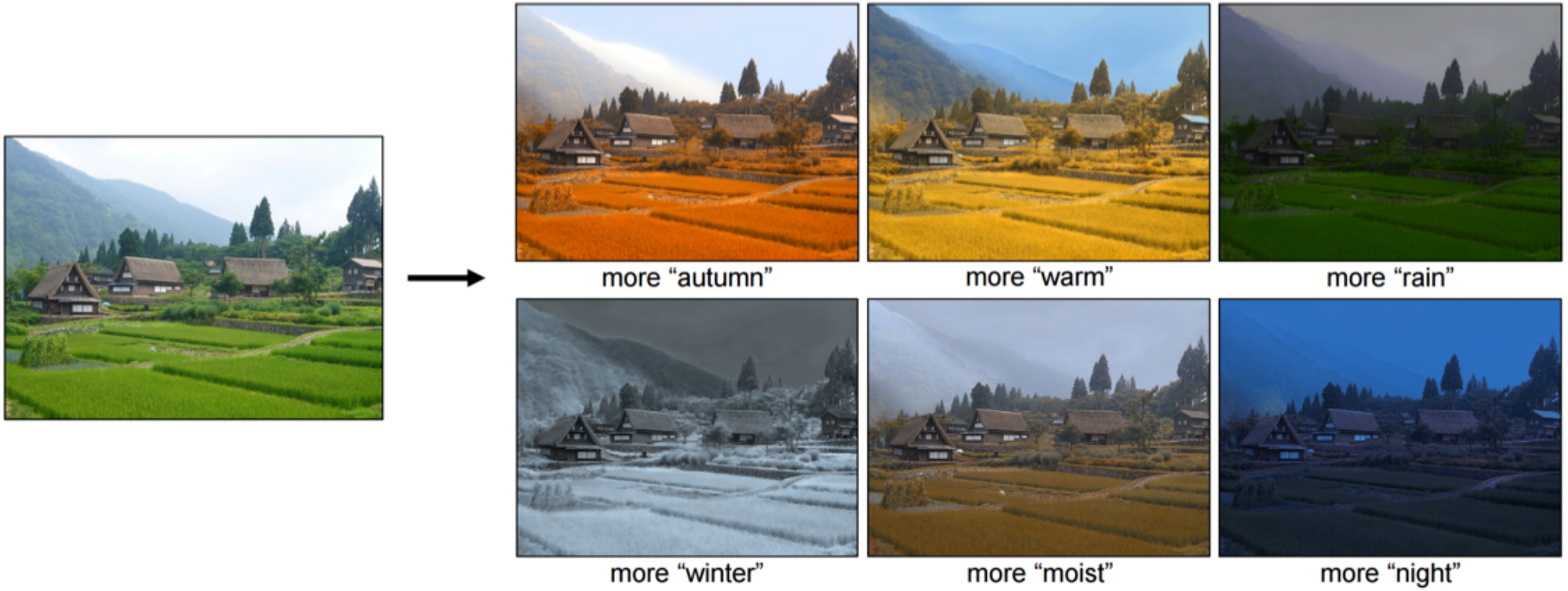
http://googleresearch.blogspot.com/2015/06/inceptionism-going-deeper-into-neural.html

RGBD (depth) datasets



[NYU Depth Dataset]

Photo Collection Editing



[Transient attributes paper]

Scene-Space Video

- https://www.youtube.com/watch?v=AAn_yKEFRj0

Building Rome in a Day

- http://grail.cs.washington.edu/rome/

Cars

- http://www.robot.cc/papers/dahlkamp.adaptvision06.pdf