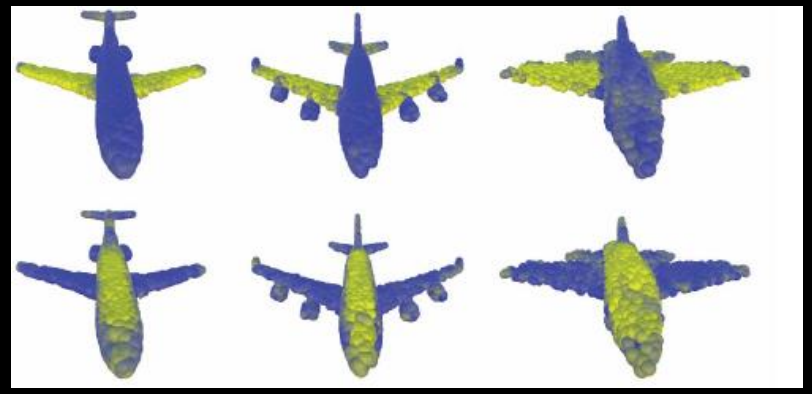
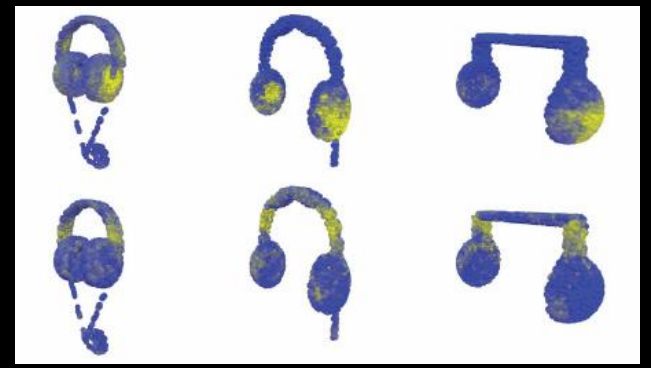
xyzCNN: Convolutional Neural Network for 3D pointcloud classification

Final Project - EEC 289Q (Spring 2018)





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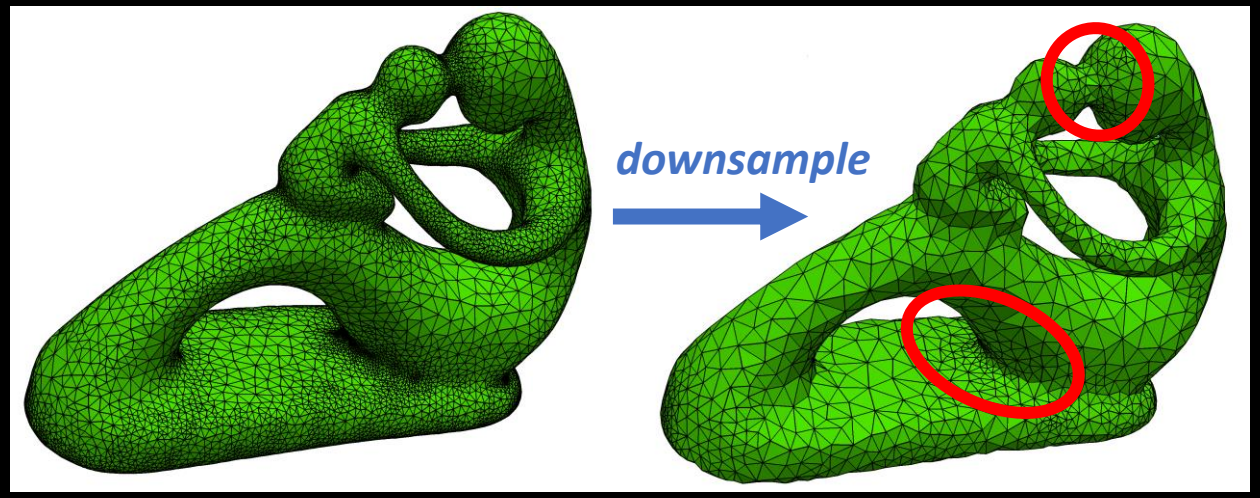
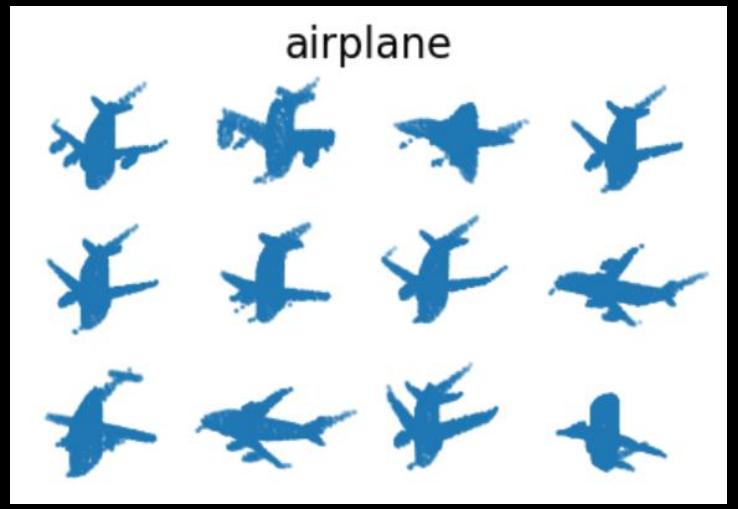
Figures: PointNet(2017), Dynamic Graph CNN for Learning on Point Clouds(2018)

PC Classification – Challenges

- Input:
  - Irregular
  - Unordered
  - Shifted or rotated

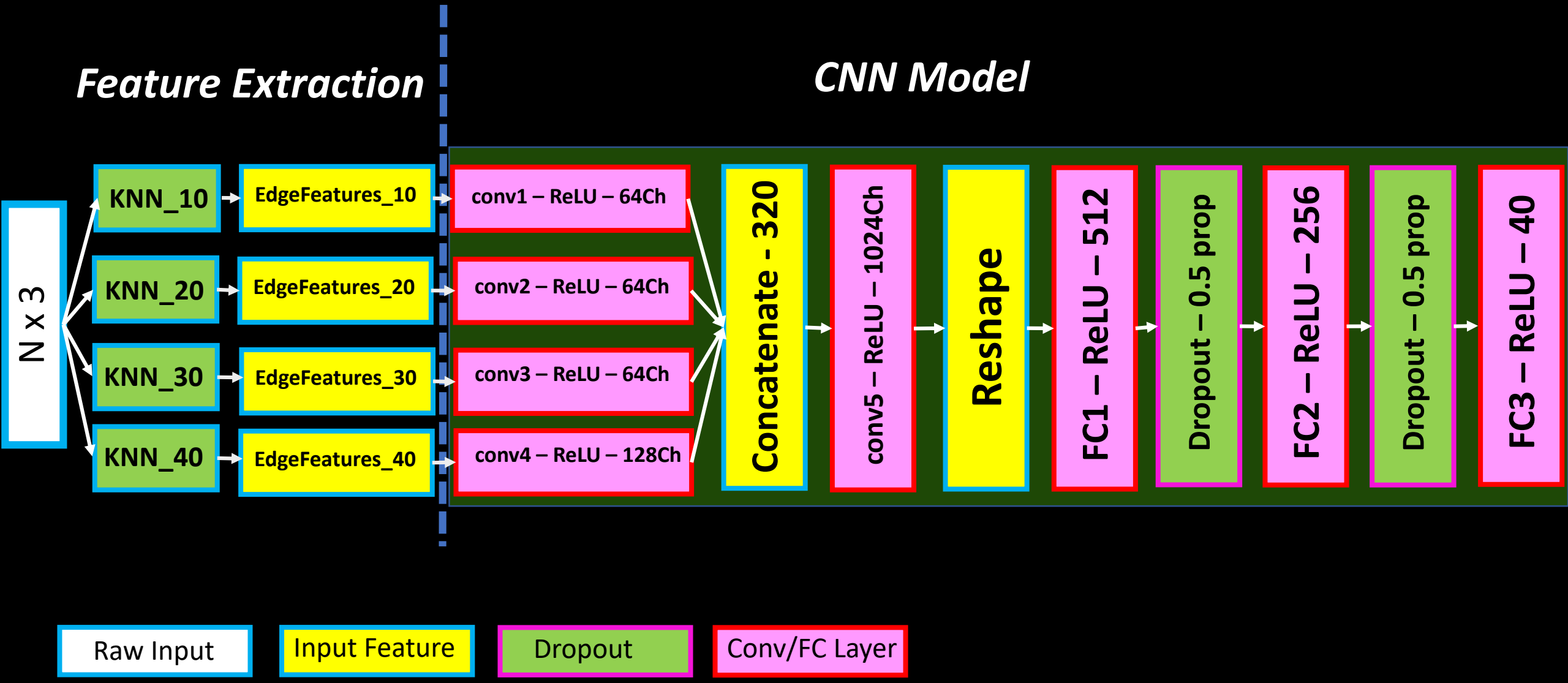




PC Classification – Solutions

- Input:
  - Irregular: pick certain number (1024) uniformly random (uneven clusters)
  - Unordered: lexicographic ordering
  - Shifted or rotated: apply shift/rotation-invariant function (norm, dot product)

PC Classification – Model



PC Classification – Evaluation

Algorithm	#Points	Accuracy
pointnet	1024	89.2
pointnet++	1024	90.7
deep sets	1000	87.1
ECC	1000	87.4
kd-network	32K	91.8
Point cnn by ext. op	1024	92.3
DGCNN	1024	91.2
Ours	**1024**	**91.5**

- **Input:**
  - **ModelNet40 (Princeton ModelNet project)**
  - **40 categories**
  - **12,311 models (9,843 for training and 2,468 for testing)**

PC Classification – Next Step

- Adding normal as raw input:
  - Distance is not enough
  - Two pairs of point might have same distance but different normal