2023 3DCV
Final Project Proposal

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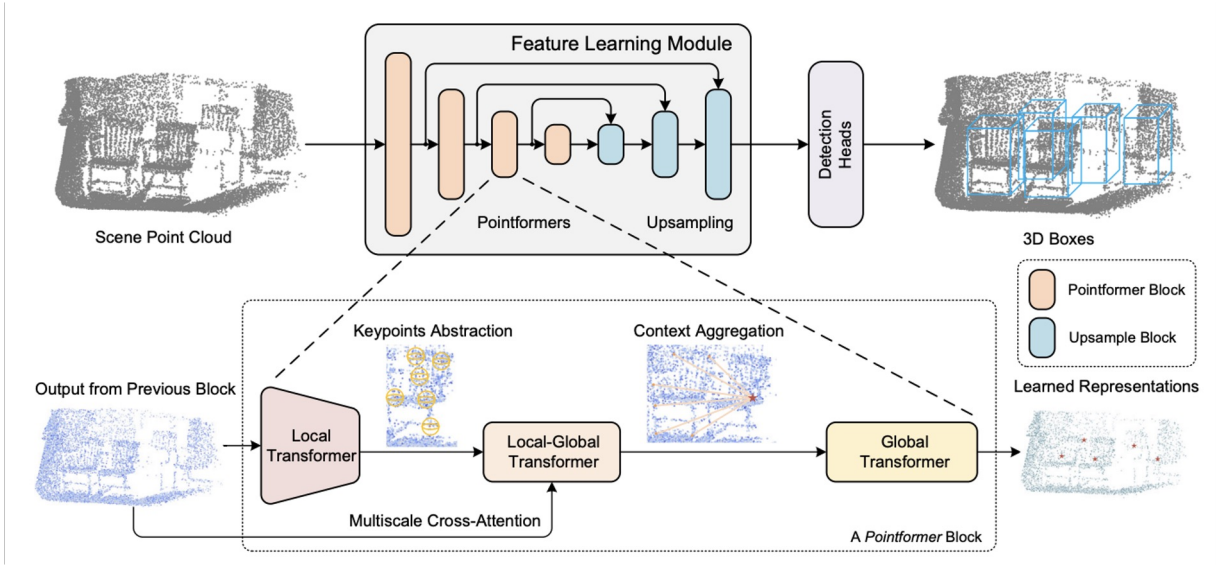
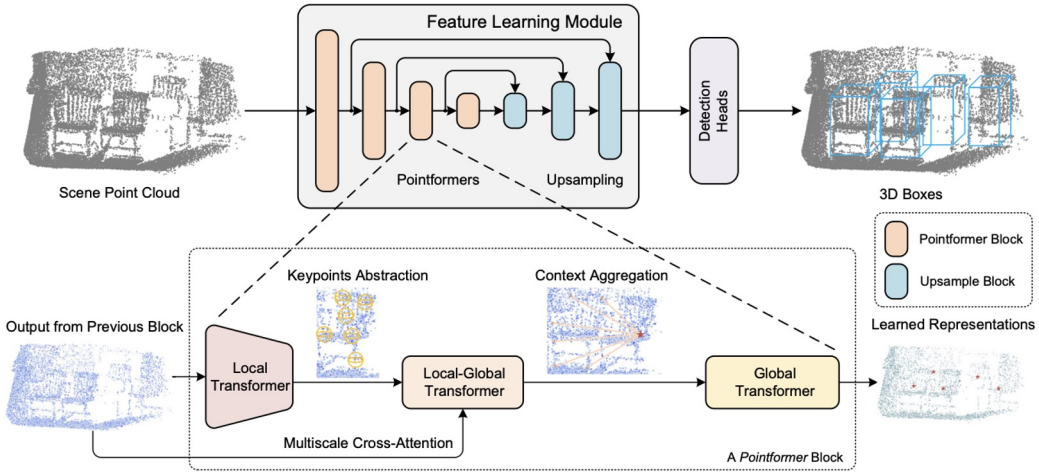
論文介紹

- 參考論文：3D Object Detection with Pointformer(CVPR 2021)
- 摘要：提出**Pointformer**。以Transformer為基礎，用來進行3D Point Cloud Object Detection設計的Backbone模型
- 架構



論文介紹

- 套用模型及對應驗證Dataset
  - VoteNet + Pointformer => SUN RGB-D, ScanNetv2
  - PointRCNN + Pointformer => KITTI
  - CBGS + Pointformer => nuScenes
- 架構



實作計畫

使用額外Datasets進行驗證

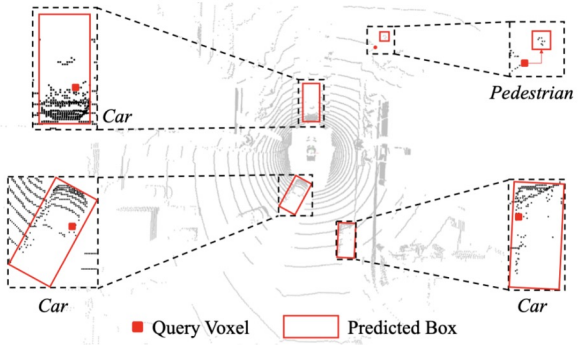
1. KITTI、nuScenes (no code implementations)
2. V2V4Real：for Vehicle-to-Vehicle Cooperative Perception

V2V4Real

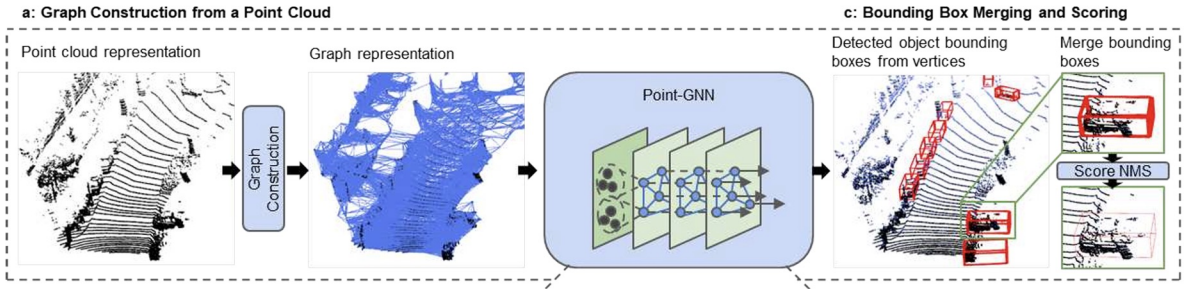
實作計畫

以Pointformer為基礎，套用於論文未提到的Object Detection Models

1. VoxelNeXt
2. PointGNN



VoxelNeXt

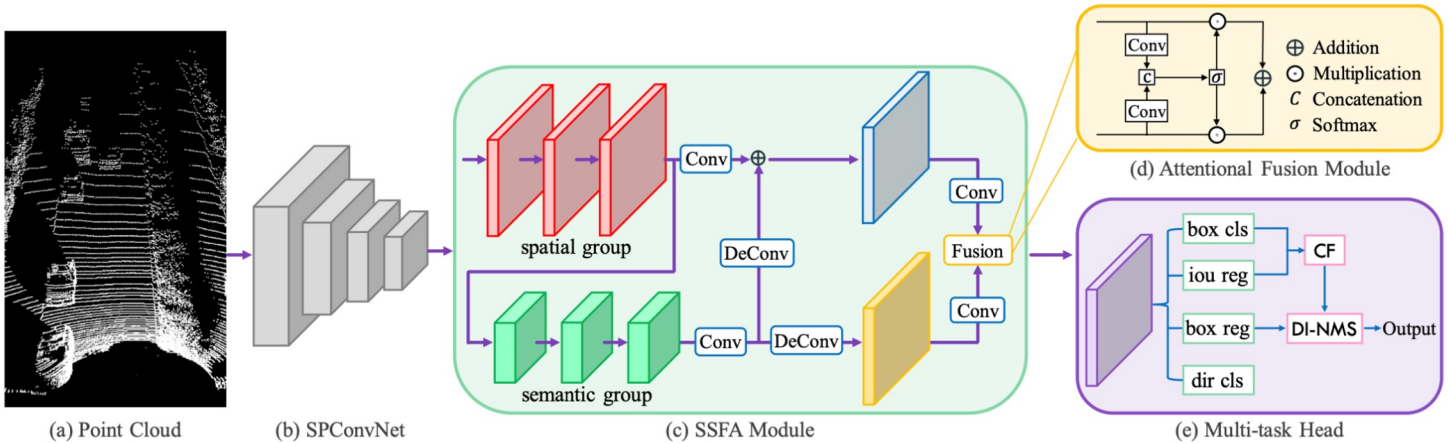


PointGNN

實作計畫

以Pointformer為基礎，套用於論文未提到的Object Detection Models

3. CIA-SSD



CIA-SSD: Confident IoU-Aware Single-Stage Object Detector From Point Cloud, AAAI 2021

預期結果

- Performance of PointRCNN with Pointformer on KITTI dataset

Method	Modality	Car(IoU=0.7)			Pedestrian (IoU=0.5)			Cyclist (IOU=0.5)		
		Easy	Moderate	Hard	Easy	Moderate	Hard	Easy	Moderate	Hard
PointRCNN [27]	LiDAR	85.94	75.76	68.32	49.43	41.78	38.63	73.93	59.60	53.59
+ Pointformer	LiDAR	**87.13**	**77.06**	**69.25**	**50.67**	**42.43**	**39.60**	**75.01**	**59.80**	**53.99**

- Performance of CBGS with Pointformer on nuScenes benchmark

Method	Modality	Car	Ped	Bus	Barrier	TC	Truck	Trailer	Moto	Cons. Veh.	Bicycle	mAP
CBGS [45]	LiDAR	81.1	80.1	54.9	65.7	70.9	**48.5**	42.9	51.5	**10.5**	22.3	52.8
+ Pointformer	LiDAR	**82.3**	**81.8**	**55.6**	**66.0**	**72.2**	48.1	**43.4**	**55.0**	8.6	**22.7**	**53.6**

=>再實現這篇論文的結果

預期結果

- Performance of VoteNet with Pointformer on SUN RGB-D validation dataset

Method	bathtub	bed	bookshelf	chair	desk	dresser	nightstand	sofa	table	toilet	mAP
VoteNet [21]	74.4	83.0	28.8	75.3	22.0	29.8	62.2	64.0	47.3	90.1	57.7
VoteNet*	75.5	**85.6**	**32.0**	**77.4**	24.8	27.9	58.6	**67.4**	51.1	90.5	59.1
+ Pointformer	**80.1**	84.3	**32.0**	76.2	**27.0**	**37.4**	**64.0**	64.9	**51.5**	**92.2**	**61.1**

- Performance of VoteNet with Pointformer on ScanNetV2 validation dataset

Method	cab	bed	chair	sofa	table	door	wind	bkshf	pic	cntr	desk	curt	fridg	showr	toil	sink	bath	ofurn	mAP
VoteNet [21]	36.3	87.9	88.7	**89.6**	58.8	47.3	38.1	44.6	7.8	56.1	71.7	47.2	45.4	57.1	94.9	54.7	92.1	37.2	58.6
VoteNet*	**47.7**	**88.7**	89.5	89.3	62.1	54.1	40.8	54.3	12.0	**63.9**	**69.4**	52.0	**52.5**	**73.3**	95.9	52.0	**95.1**	42.4	62.9
+ Pointformer	46.7	88.4	**90.5**	88.7	**65.7**	**55.0**	**47.7**	**55.8**	**18.0**	63.8	69.1	**55.4**	48.5	66.2	**98.9**	**61.5**	86.7	**47.4**	**64.1**

=>以此篇論文作為baseline，期望表現比較好

分工表

People	郭思言	陳祈安	張璟榮
Proposal	上台報告、簡報製作	簡報製作	簡報製作
Implement	1. 蒐集 Dataset 2. 熟悉 MMDetection3D 3. 研究 Pointformer、Object Detection Model及進行相關實作		
Final Project	簡報製作	Final Report 製作	上台報告

Thanks