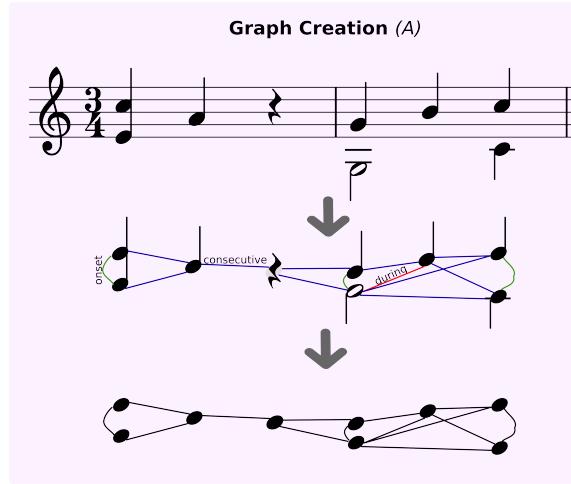


Cadence Detection in Symbolic Music using Graph Neural Networks

Emmanouil Karystinaios and Gerhard Widmer

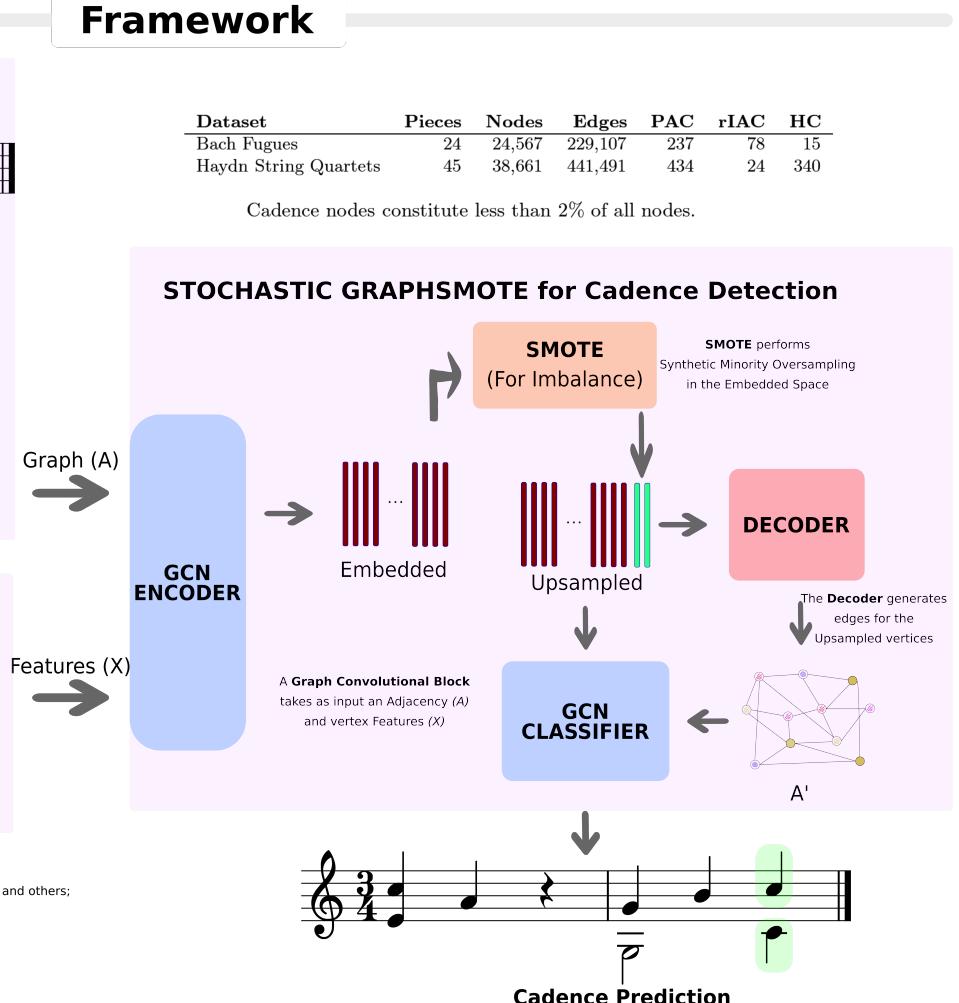
Johannes Kepler University Linz

Framework



Feature Extraction (X)

Type	note ₁	Onset	Duration	Pitch	Topology	Cadence feats
note ₁	on ₁	dur ₁	pi ₁	top ₁	cad ₁	
⋮	⋮	⋮	⋮	⋮	⋮	⋮
note _N	on _N	dur _N	pi _N	top _N	cad _N	
rest ₁	on _{N+1}	dur _{N+1}	0	top _{N+1}	cad _{N+1}	
⋮	⋮	⋮	⋮	⋮	⋮	⋮
rest _K	on _{N+K}	dur _{N+K}	0	top _{N+K}	cad _{N+K}	



Results

Dataset	Model	F1 Note	F1 Onset	F1 Beat	Prec. Beat	Recall Beat
Bach Fugues (PAC) (12 fugues)	Bigo et al. model	-	-	0.80	0.89	0.72
	SGSMOTE	0.85	0.75	0.73	0.70	0.77
	Pretrained SGSMOTE	0.90	0.83	0.80	0.74	0.89
Bach Fugues (rIAC) (12 fugues)	Bigo et al. model	-	-	0.68	0.71	0.65
	SGSMOTE	0.87	0.75	0.73	0.75	0.72
	Pretrained SGSMOTE	0.87	0.73	0.71	0.62	0.82
Haydn String Quartets (PAC) (21 pieces)	Bigo et al. model	-	-	0.69	0.60	0.82
	SGSMOTE	0.77	0.56	0.59	0.47	0.78
	Pretrained SGSMOTE	0.81	0.63	0.64	0.54	0.78
Haydn String Quartets (HC) (21 pieces)	Bigo et al. model	-	-	0.29	0.19	0.56
	SGSMOTE	0.65	0.32	0.30	0.33	0.27
	Pretrained SGSMOTE	0.69	0.44	0.41	0.41	0.41

Results using half of the dataset for training, half for testing.
 Bach: fugues no.1-12 were used for training, no.13-24 for testing; Haydn: random 21:21 split.

The pretrained network was trained on the other dataset, i.e. Pretrained SGSMOTE for Bach Fugues was pre-trained on string quartets, etc.

Classification is binary, the presented F1 scores are for the positive class, i.e., the cadence (PAC: Perfect Authentic Cadence; rIAC: root position Imperfect AC; HC: Half Cadence)

Contributions

Graph Modelling of Musical Scores :

- How Nodes and Edges are created
- How Node Features are extracted

GCN for Cadence Detection :

- GCN to deal with heavy imbalance in large graphs.
- Fine grain predictions on three levels: Note, Onset and Beat.

Read Our Paper



<https://tinyurl.com/cadet-2022>

See the Code



<https://github.com/manoskary/cadet>

