Supplementary Results

1 Supplementary Result for Node's Role Prediction using CT-EVGCN

We use three benchmark datasets as we mentioned in our main paper; MIT Reality Mining Dataset[1], Contact Primary School Dataset[2], Contact High School Dataset[3]. We describe the original characteristics of these datasets by table 1.

Now we mention our predicted node's role along with actual

Table 1: Dataset description

Dataset	Nodes	Unique Edges	Timestamps	Domain
MIT Reality Mining	96	2539	9 months	Mobile phone calls & proximity
Contact Primary School	242	12,799	106,879	Human proximity (face-to-face)
Contact High School	327	7937	172,035	Human proximity (face-to-face)

node's role for the last timestamp for every described datasets in table 1 by table 2. As we don't have any benchmark setter for this task in temporal domain so, we consider the final timestamp (t_n) graph snapshot (G_n) as our target, whereas all the graph snapshots $(G_1, G_2, G_3, \ldots, G_{n-1})$ up till previous timestamp (t_{n-1}) we proceed for training phase. We process temporal edges chronologically for each dataset to preserve the fine-grained event dynamics by avoiding discretizations of snapshots. At each continuous timestamp, we calculate node features and cluster them into three roles (central, bridge, peripheral) using Mini-batch K-Means (K=3). We provide the results of each clusters (average degree, average betweenness, average eigenvector centrality, average core size) through table 3.

Table 2: Node's Role Prediction Results

Dataset	Unique Timestamps	Nodes at final timestamp	Predicted Node's Role			Actual Node's Role		
			Central	Bridge	Peripheral	Central	Bridge	Peripheral
MIT Reality Mining	30398	96	51	30	15	54	34	8
Contact Primary School	3099	242	111	75	56	85	98	59
Contact High School	7374	327	14	268	45	52	201	74

We also generate heatmaps, PR-AUC curve and ROC-AUC curve for each dataset's result, which we show by figure 1, figure 2 and figure 3 respectively, before that we only mention about these metrics as follows:

- **Heatmap:** Through the use of color intensity to display individual values, a heatmap makes it simple to see patterns, correlations, and changes in data.
- **PR-AUC Curve:** Plotting precision versus recall over thresholds, the Precision-Recall AUC (PR-AUC) curve assesses a model's capacity to identify positive samples in unbalanced datasets.
- **ROC-AUC Curve:** To assess a model's overall classification performance, the Receiver Operating Characteristic AUC (ROC-AUC) curve shows the true positive rate against the false positive rate across thresholds.
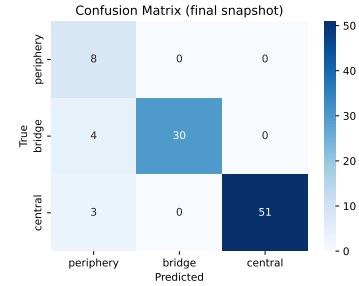

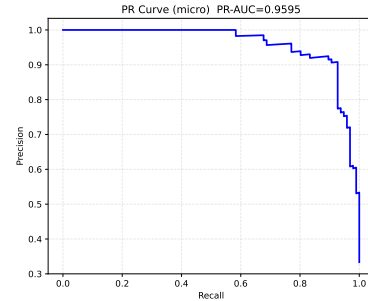
[1] http://konect.cc/networks/mit/
[2] http://www.sociopatterns.org/datasets/primary-school-cumulative-networks/
[3] http://www.sociopatterns.org/datasets/high-school-contact-and-friendship-networks/

Table 3: Cluster statistics for MIT Reality Mining, Primary School Contact, and High School Contact Datasets
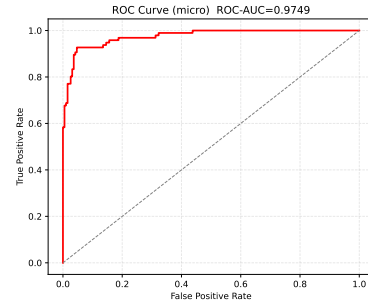
MIT Reality Mining Dataset				
Cluster	Avg Deg.	Avg Bet.	Avg Eig.	Avg Core	Avg Size
Cluster-0	−2.4031	−0.5571	−2.4065	−3.5460	38
Cluster-1	0.7243	0.3367	0.7252	0.5628	54
Cluster-2	−2.2346	−0.5508	−0.6794	−3.2544	4
Primary School Contact Dataset				
Cluster	Avg Deg.	Avg Bet.	Avg Eig.	Avg Core	Avg Size
Cluster-0	−0.2371	−0.3382	−0.2404	0.1858	80
Cluster-1	1.2276	1.2571	1.1343	0.7365	108
Cluster-2	−1.3018	−1.0459	−1.3043	−1.6384	54
High School Contact Dataset				
Cluster	Avg Deg.	Avg Bet.	Avg Eig.	Avg Core	Avg Size
Cluster-0	−1.0808	−0.6348	−0.9600	−1.0979	103
Cluster-1	1.8533	2.0228	1.5186	0.7596	40
Cluster-2	0.2269	−0.0778	0.1806	0.4310	185

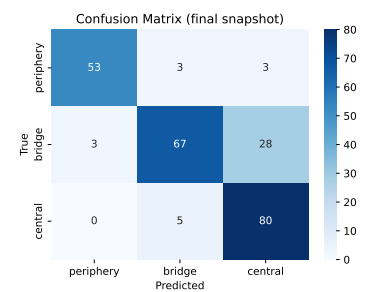**(a) Heatmap for MIT Reality Mining Dataset**

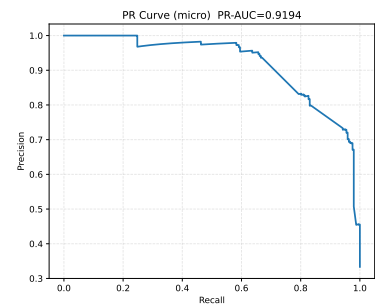**(b) PR-AUC curve for MIT Reality Mining Dataset**

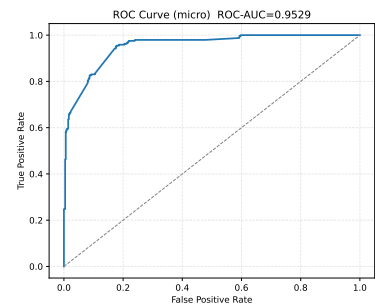**(c) ROC-AUC curve for MIT Reality Mining Dataset**

Figure 1: Confusion matrix heatmap, PR-AUC curve, and ROC-AUC curve for the MIT Reality Mining dataset.

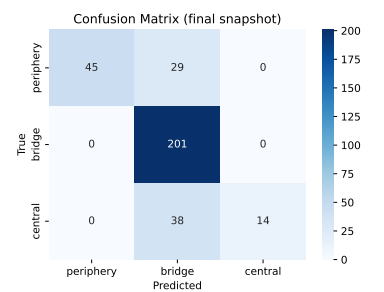**(a) Heatmap for Contact Primary School Dataset**

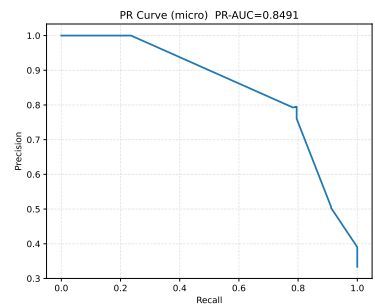**(b) PR-AUC curve for Contact Primary School Dataset**

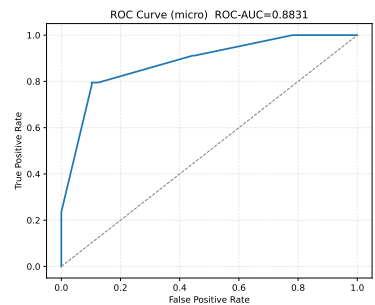**(c) ROC-AUC curve for Contact Primary School Dataset**

Figure 2: Confusion matrix heatmap, PR-AUC curve, and ROC-AUC curve for the Contact Primary School dataset.

(a) Heatmap for High School Contact Dataset

(b) PR-AUC curve for High School Contact Dataset

(c) ROC-AUC curve for High School Contact Dataset

Figure 3: Confusion matrix heatmap, PR-AUC curve, and ROC-AUC curve for the High School Contact dataset.