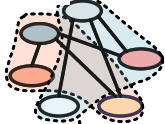


Reusability-driven Semantic

Grouping (Section IV-D)

PAP, PSP, PAPP, PSPP
PAPSP, PSPAP...

On CPU



Channel 0

PAP, PAPP,
PAPSP

...

Channel 3

Channel 1

PSP, PSPP,
PSPAP

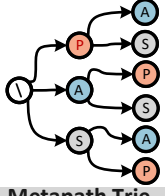
...

Channel 4

(a)

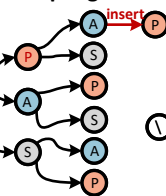
Redundancy-aware Sampling (Section IV-B)

Basic Relations

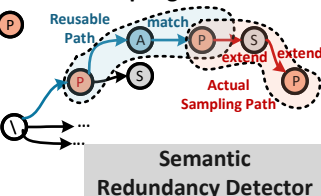


Metapath Trie

Sampling PAP



Sampling PAPSP



Semantic
Redundancy Detector

Memory Access
Handler

Scheduler

Neighbor
Sampler

HBM

Matching

Sampling
Insert

Matching

Sampling
Extend

ESR-HGNN Architecture and Optimized Pipeline (Section IV-C)

(b)

End-to-end Inference

Sampling

Data Loading

On GPU / HiHGNN

Feature Projection

Neighbor Aggregation

Semantic Fusion

Output Embeddings

(c)