

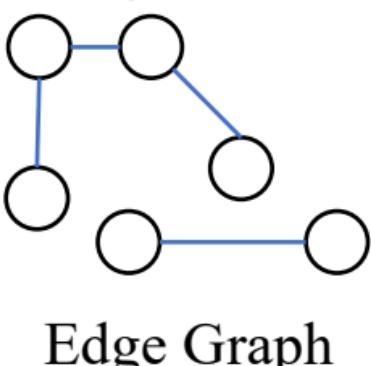
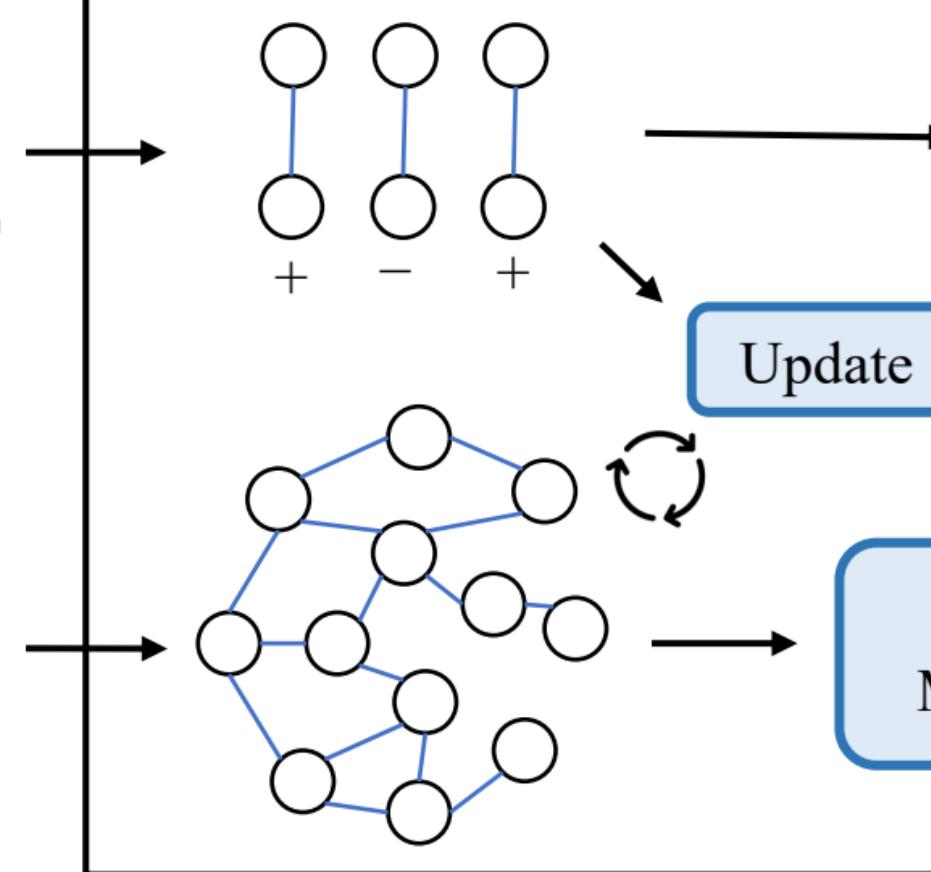
Input Data Graph

Input Edge Operations

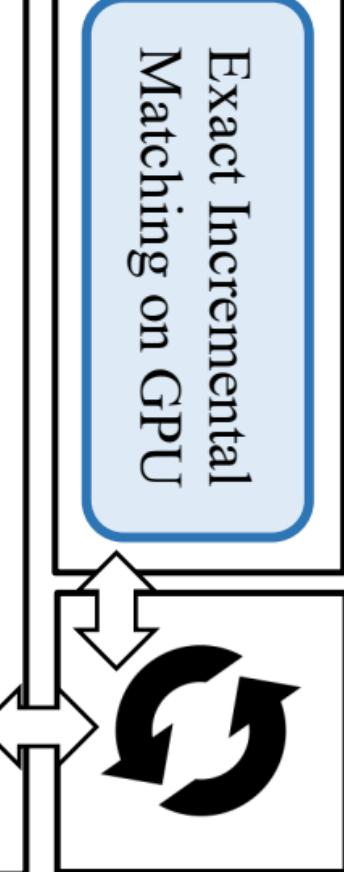
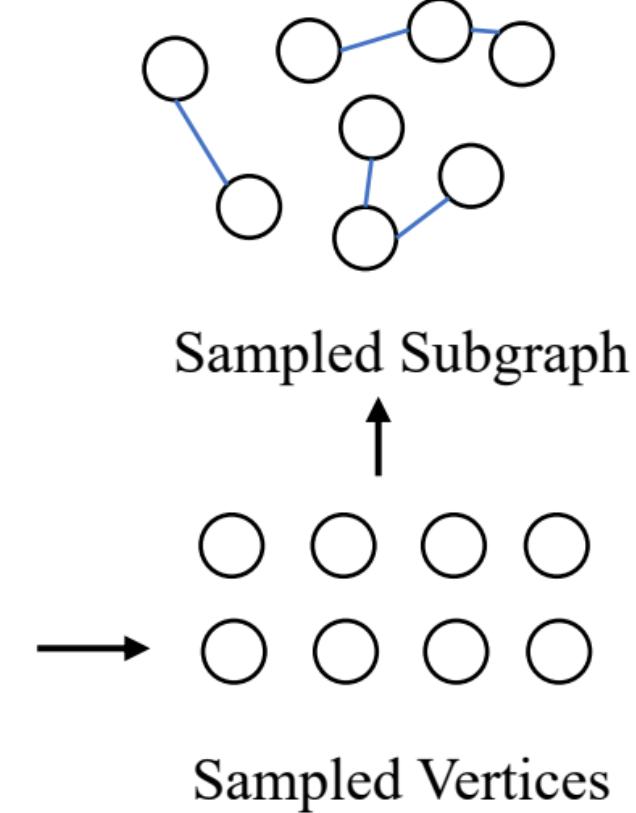
CPU Main Memory

Copy to GPU

Exact Incremental Matching on GPU



Approximate Matching on CPU

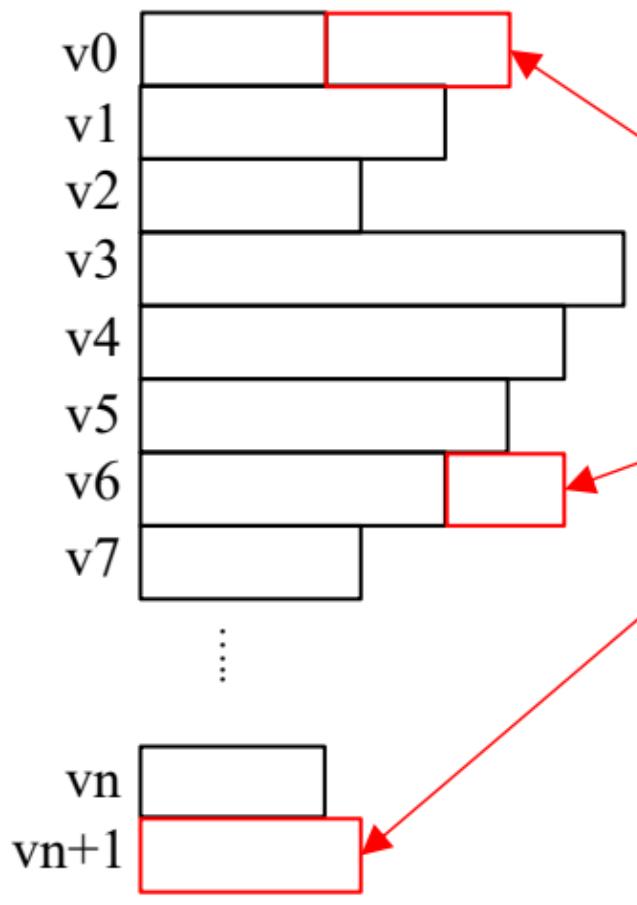


Exact Incremental Matching on GPU

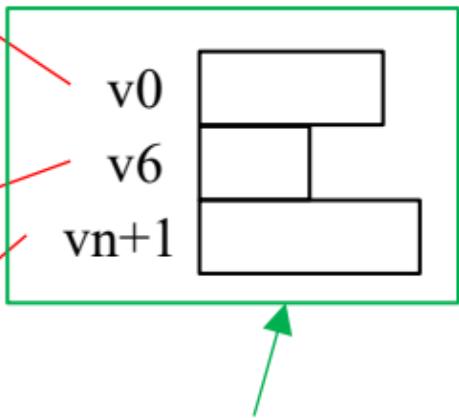
Zero Copy

# Data Graph

# Edge Graph



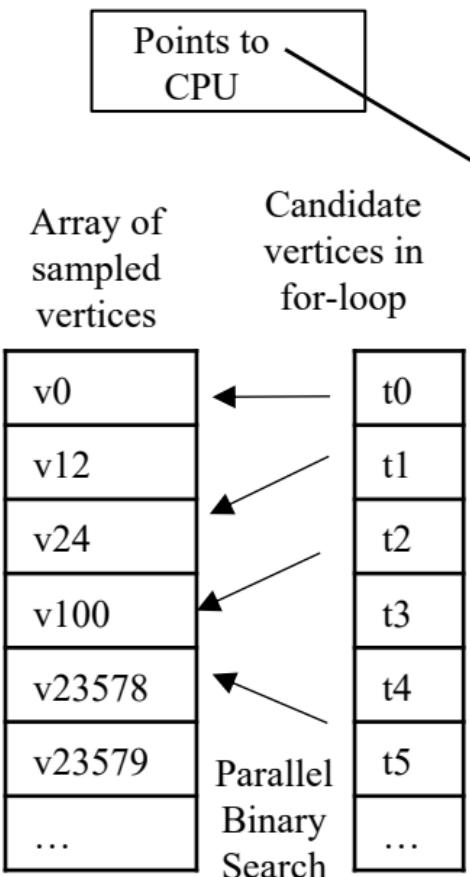
Step2: Insert Edge  
Graph to Data Graph



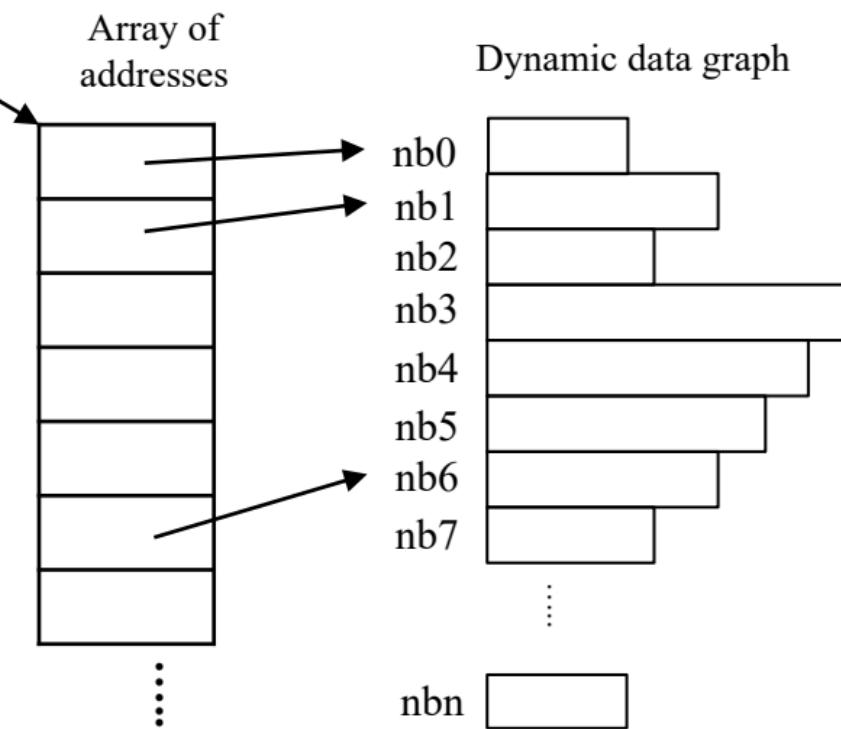
Step1: Sort Edge Graph

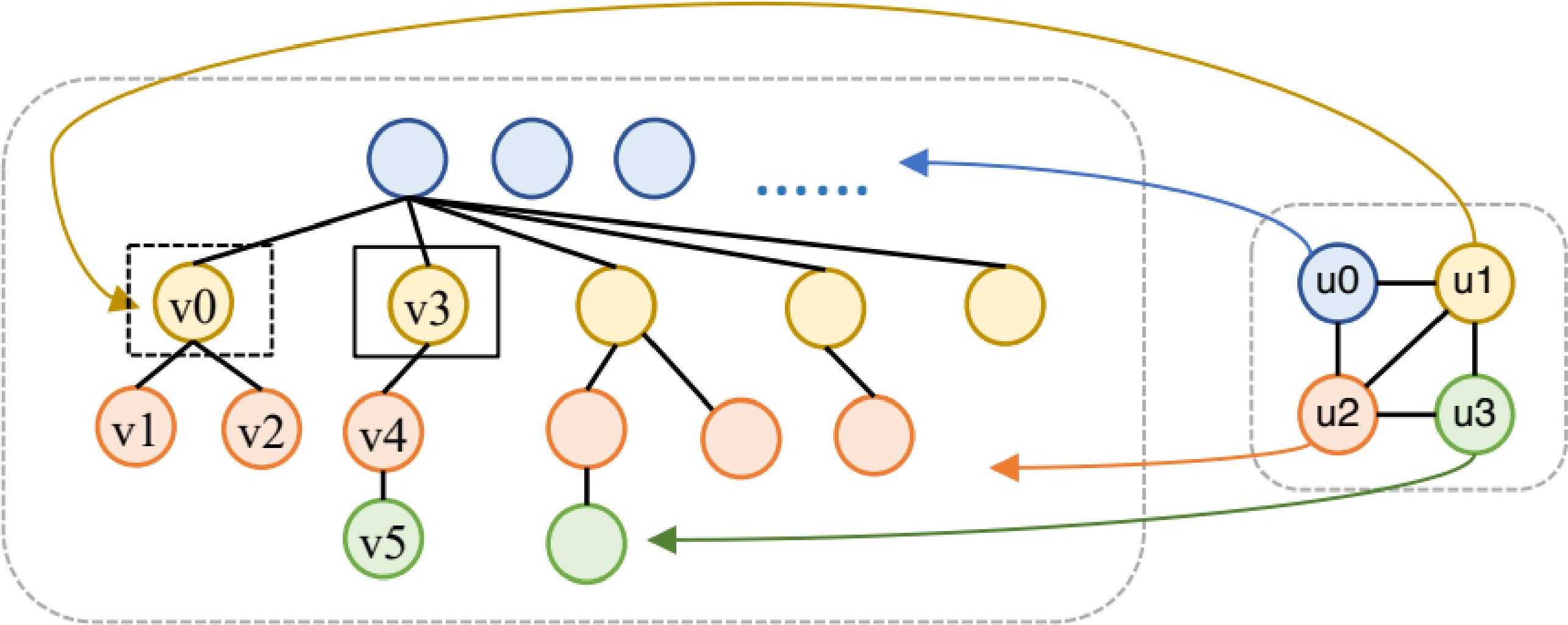
Step3: Update Unified  
Virtual Address

## GPU Global Memory



## CPU Main Memory





```
for( $v_0, v_1 \in \Delta E$ ) {
```

```
    for( $v_2 \in N(v_0) \cap N'(v_1)$ )
```

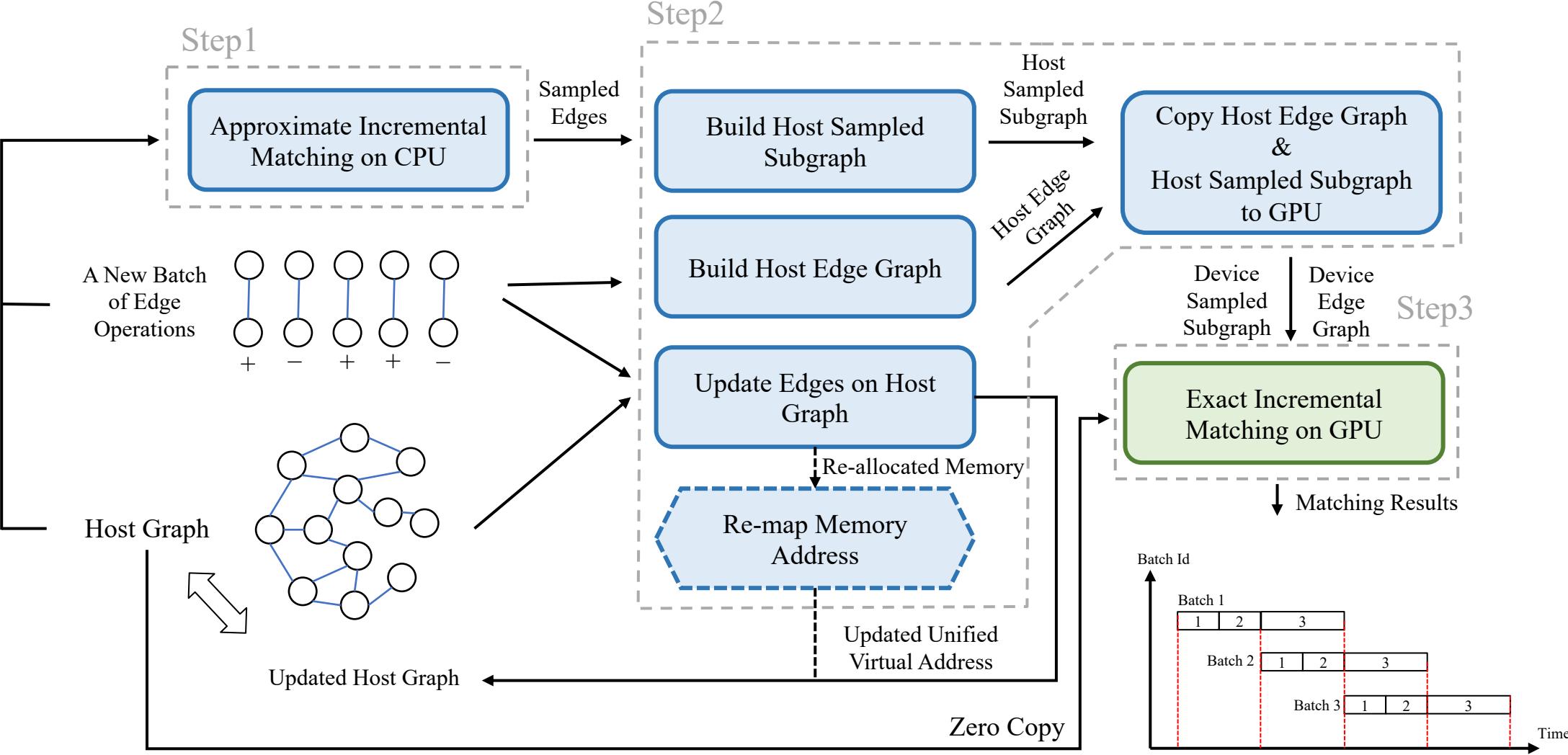
```
        for( $v_3 \in N(v_0) \cap N(v_2)$ )
```

**Set Intersections**



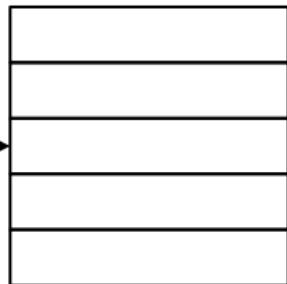
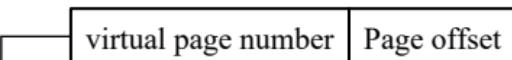
**Search Tree**

**Query Graph**

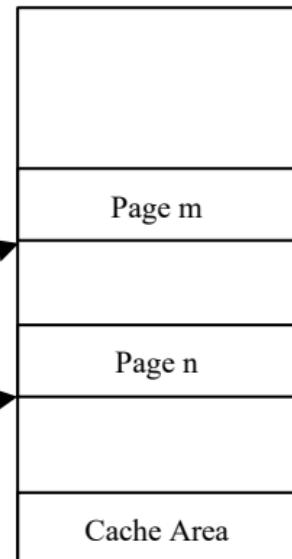


CPU Main Memory

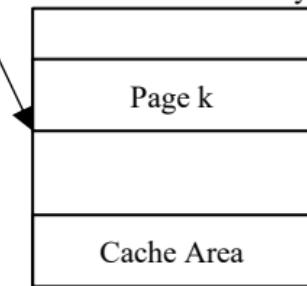
Unified Virtual Address



Page Table



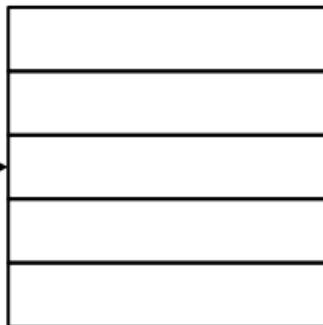
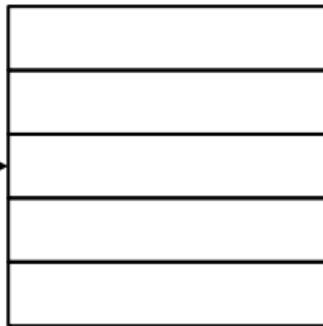
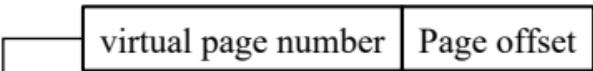
GPU Global Memory



Unified Memory

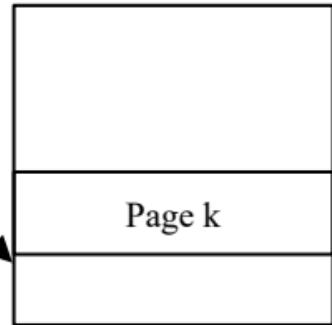
CPU Virtual Address

CPU Main Memory

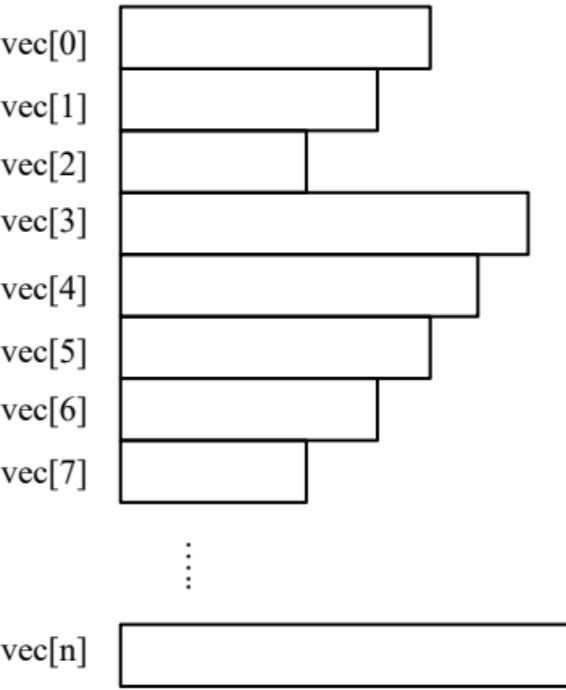


GPU Virtual Address

GPU Global Memory

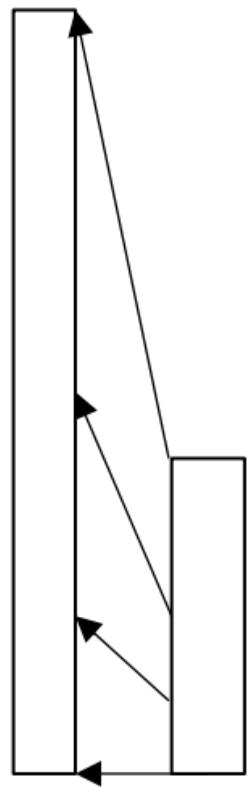


Adjacency List



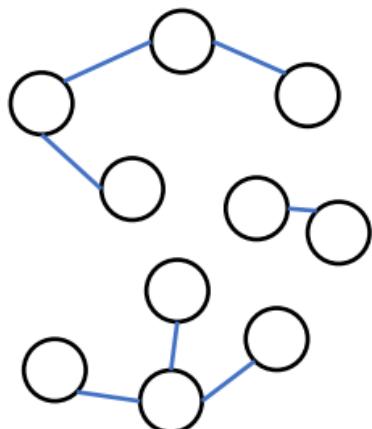
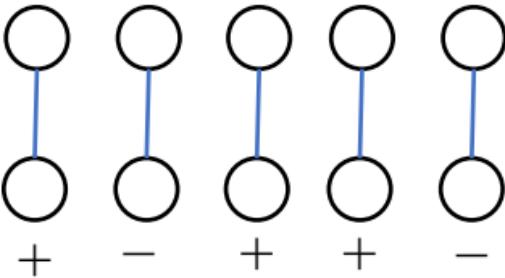
Host Graph

Compressed Sparse Row



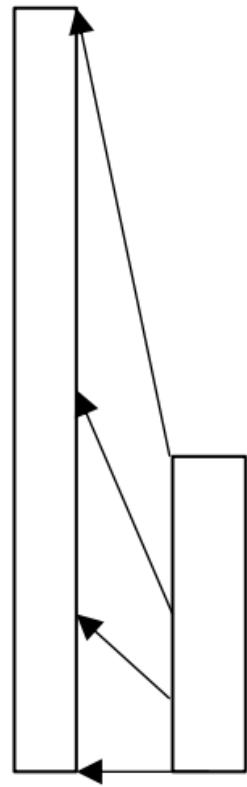
Host Sampled Subgraph

Compressed Sparse Row

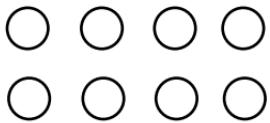


Host Sampled Subgraph

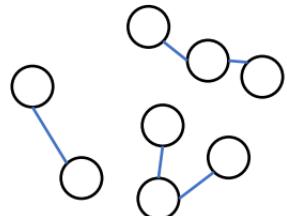
Host Edge Graph



# CPU Main Memory

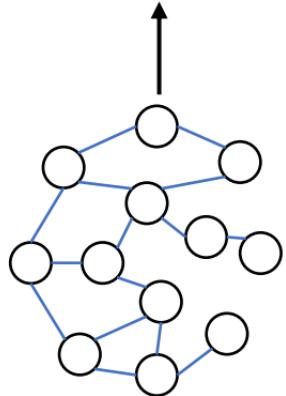


Sampled Vertices



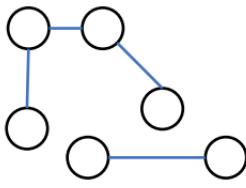
Sampled Subgraph

Approximate Matching on CPU

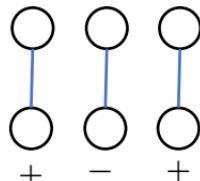


Data Graph ← **Inputs** → A Batch of Edge Operations

Update



Edge Graph



A Batch of Edge Operations

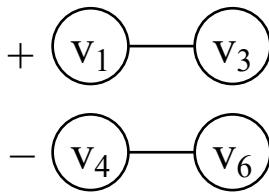
Unified Virtual Address



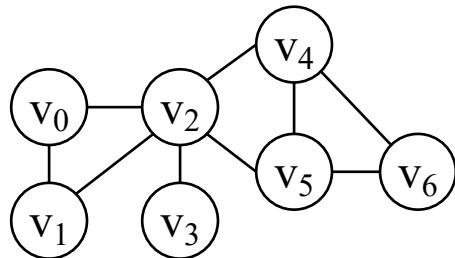
GPU Global Memory

Exact Incremental Matching on GPU

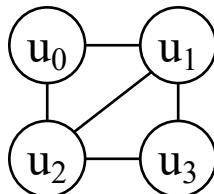
Copy to GPU



## A Batch of Edge Update



Data Graph G



Query Graph Q

Copy to GPU



Sampled Vertices

Sampled matching  
on CPU

