

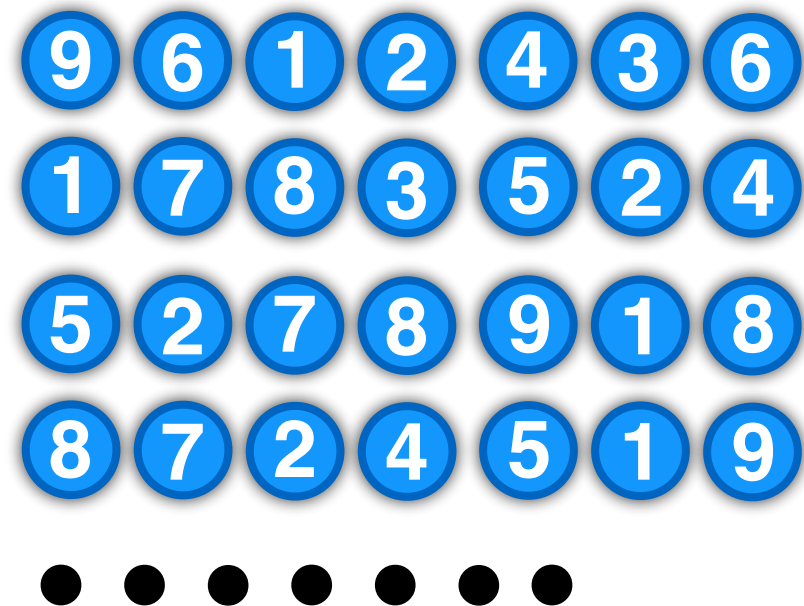
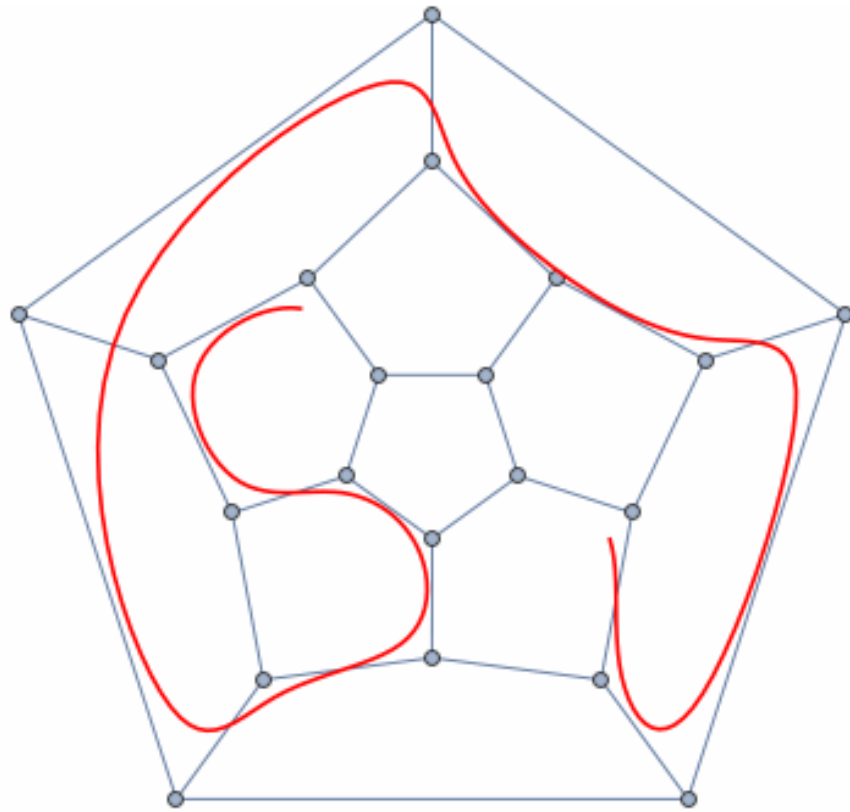
Attributed Random Walks for Graph Recurrent Networks

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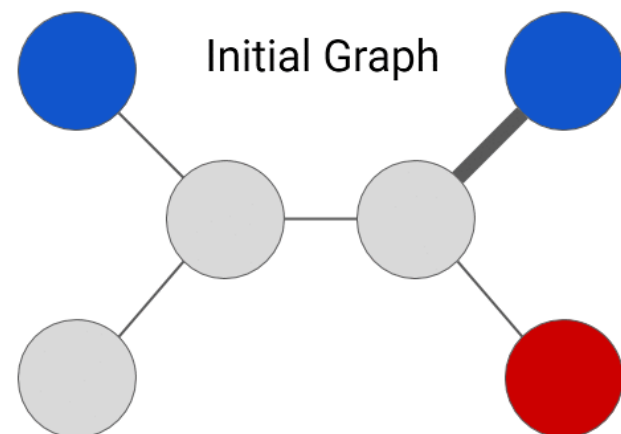
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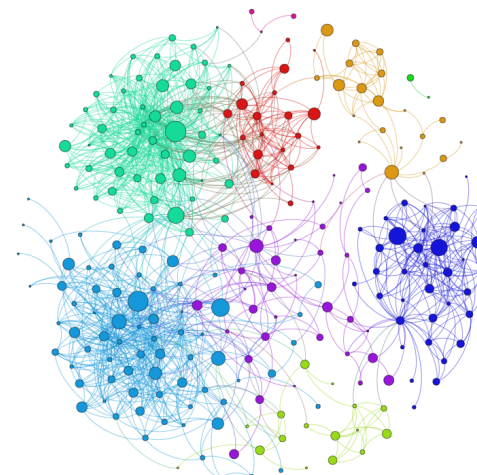
Random Walks in Network Analysis



- Label Propagation



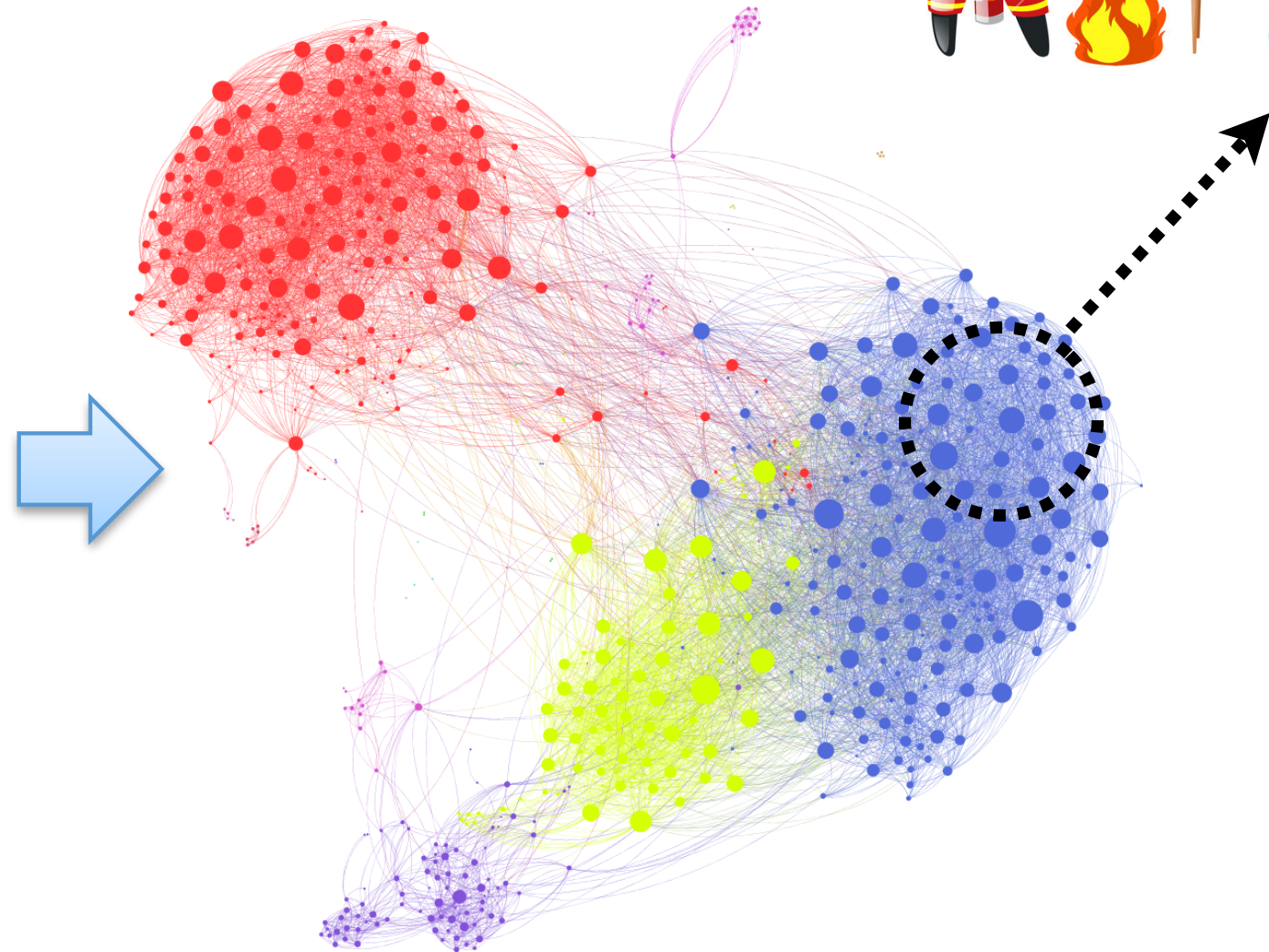
- Network Embedding



0.54	0.27
0.22	0.91
0.55	0.28
0.98	0.11
0.32	0.87
0.26	0.11

Real-world Systems are Attributed Networks

Nodes have
different attributes



Node Attributes Benefit Random Walks



Texas A&M University @TAMU · Jun 7

A new \$1 million @ENERGY grant will help @TAMUEngineering explore the use of big data, A.I., & machine learning to bolster power grids! #tamu



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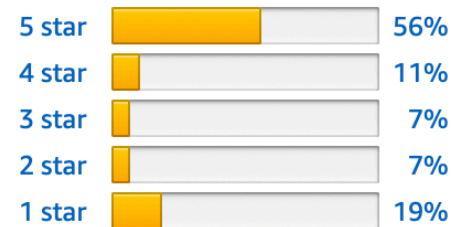
Texas A&M University @TAMU · Jun 7

Texas A&M is ranked No. 8 in the nation in this year's @schoolsEDU 'Best Colleges' survey! Whoop! 🙌 #tamu

Customer reviews

★★★★☆ 299

4.0 out of 5 stars



Apple MacBook Pro (13" Retina, 2.1GHz Intel Core i5, 256GB)

by Apple

Style: Intel Core i5 | Capacity: 256GB | Color: Silver

Price: \$1,099.99 ✓prime

Write a review

Top positive review

[See all 200 positive reviews](#)



MS

★★★★★ this is my first MacBook Pro and its amazing! I recommend it over the touch bar model ...

November 12, 2017

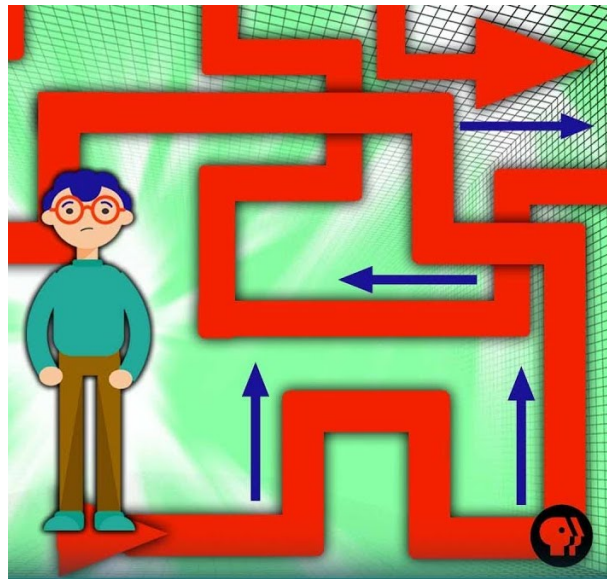
I upgraded from a mid 2012 MacBook Air 13", this is my first MacBook Pro and its amazing !

I recommend it over the touch bar model due to the fouling facts:

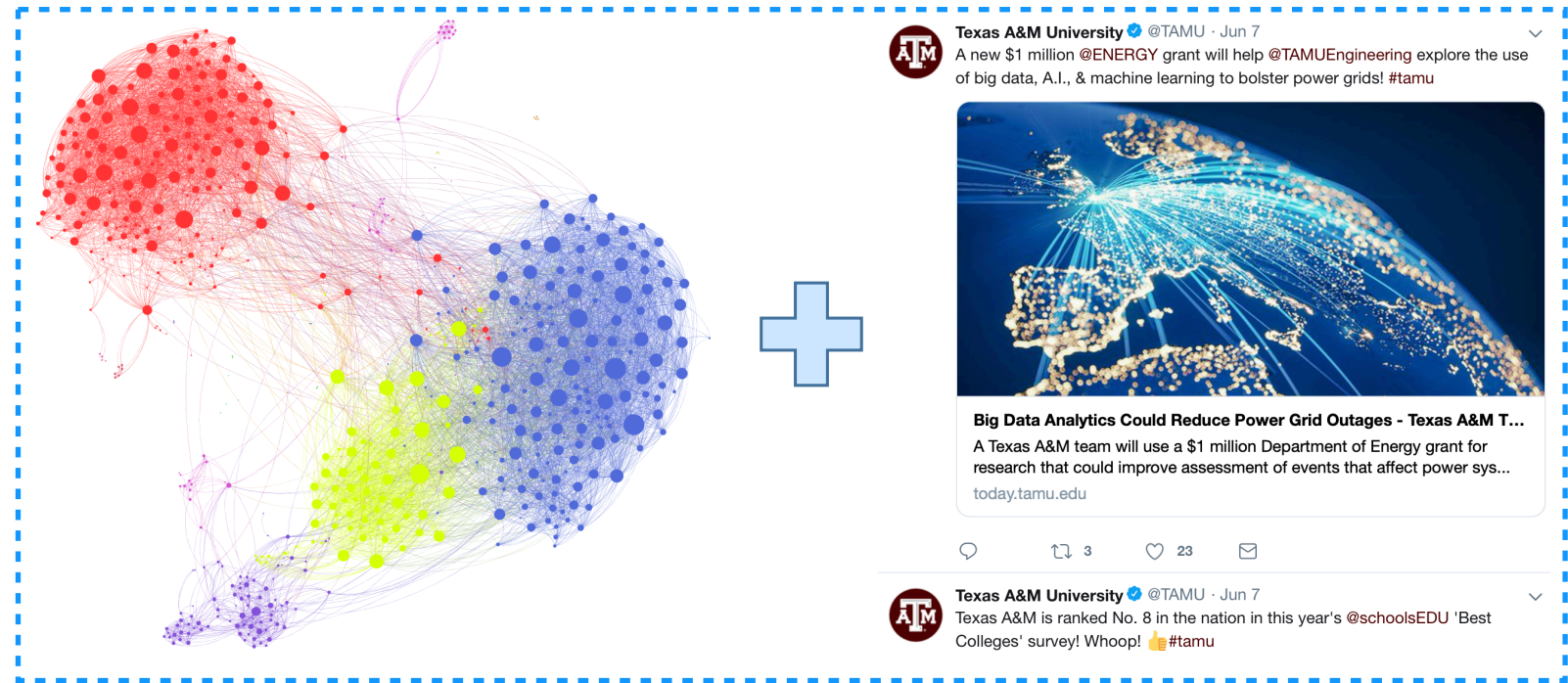
- 1- larger battery compared to Touch Bar model ----> longer battery life
- 2- lower CPU wattage (higher efficiency) i.e ----> longer battery life
- 3- you have physical function bars ALL THE TIME!!
- 4- you get better value for the money you paid !

- Node attributes contain plentiful information that complements the network.
- Bring opportunities to the random-walk-based analysis.

Challenges: Complication & Heterogeneity



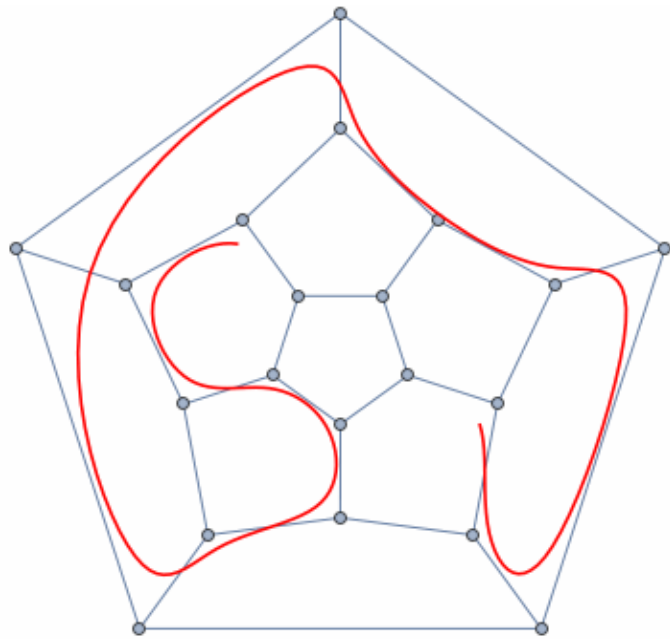
Random Walks



Attributed Networks

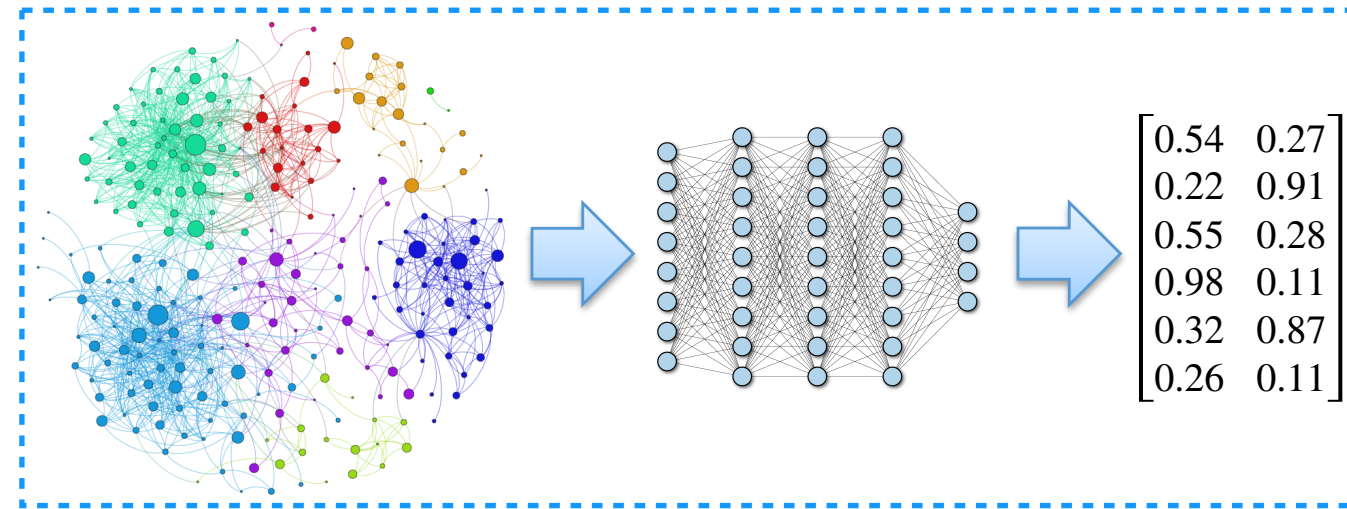
- How to develop random walks for attributed networks towards an effective joint information extraction?
- Attributes make node interactions more complicated.
- Attributes are heterogeneous with topological structures.

Random-walk-based Deep Attributed Network Embedding



Random Walks on
Attributed Networks

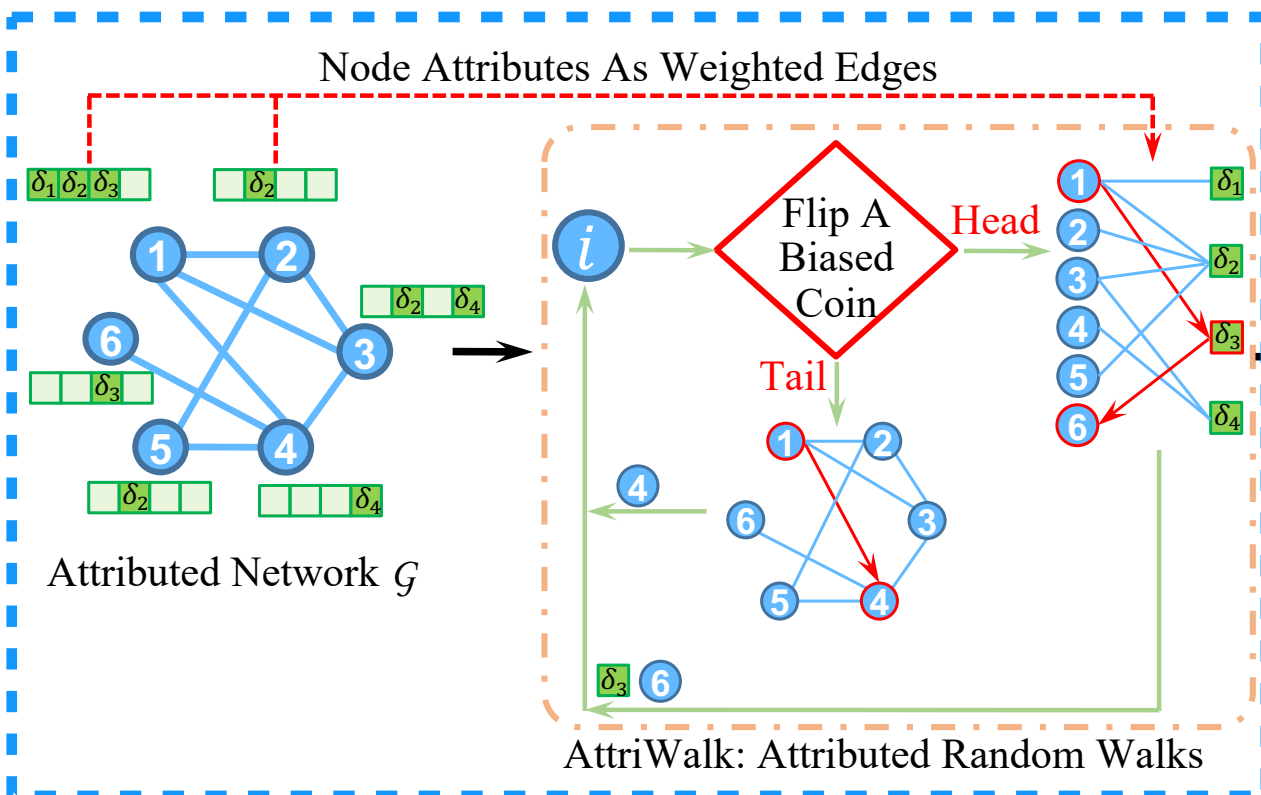
boost



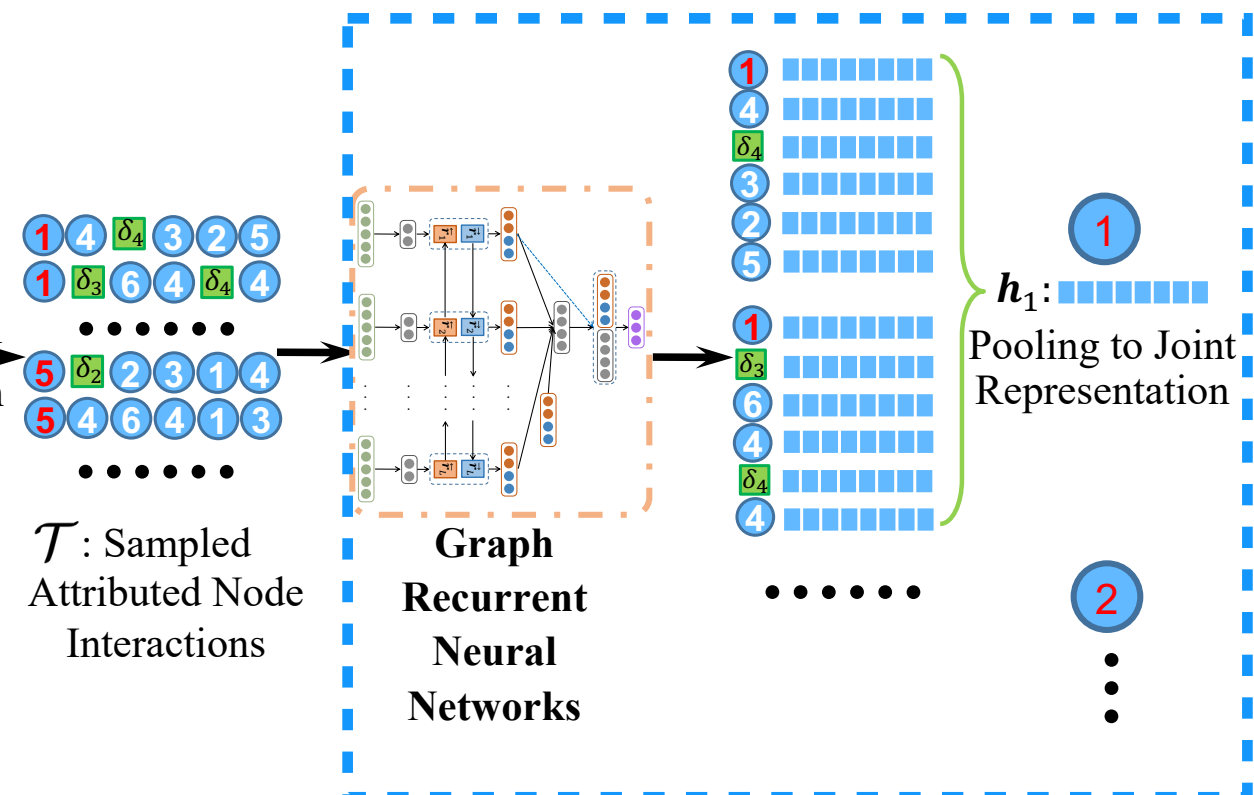
Deep Network Embedding

Apply random walks on attributed networks to boost deep node representation learning.

Graph Recurrent Networks with Attributed Random Walks

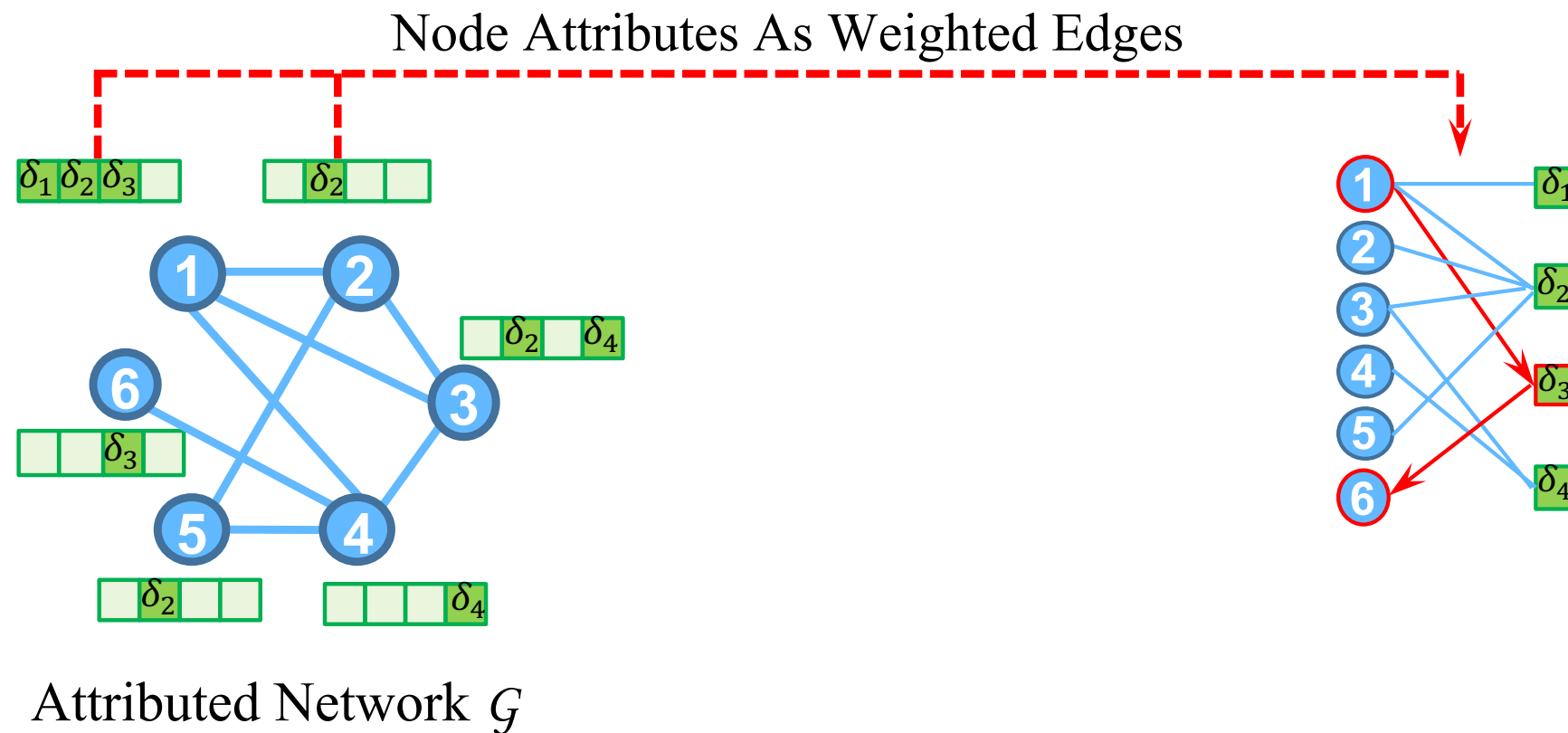


Component I. AttriWalk



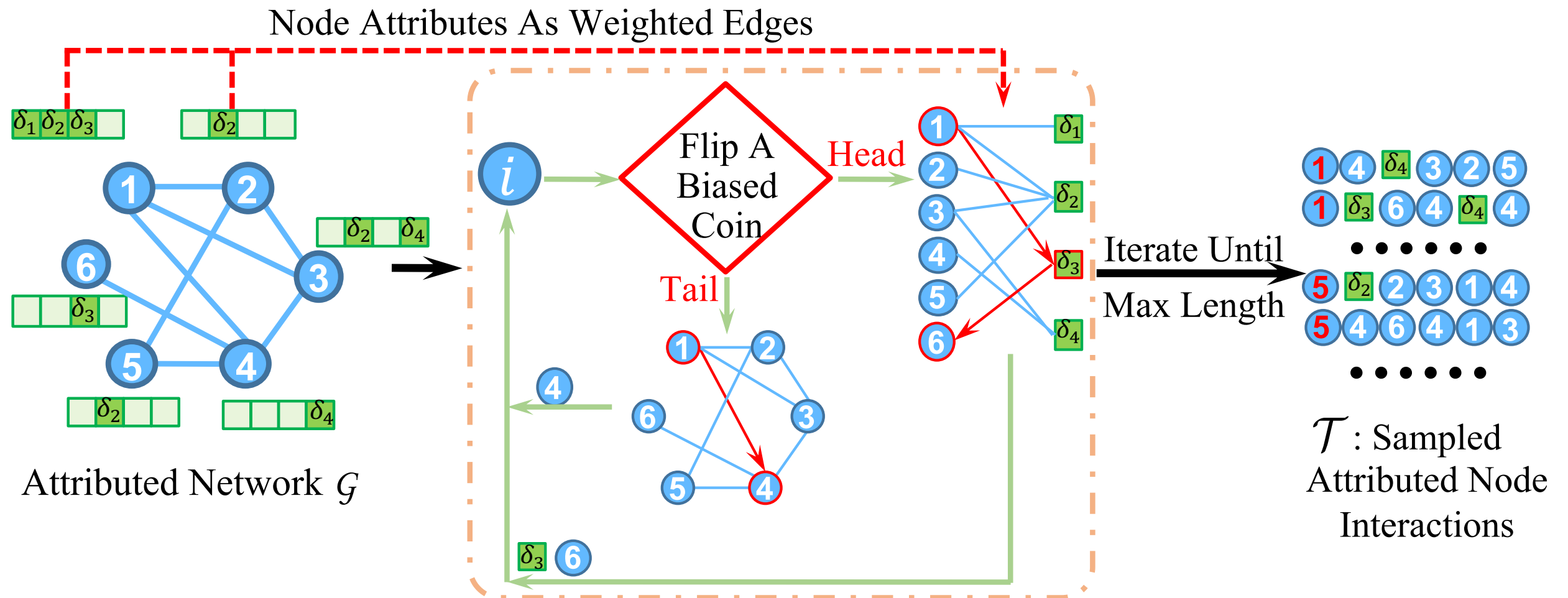
Component II.
Graph Recurrent
Networks (GRN)

Joint Walking Mechanism: AttriWalk



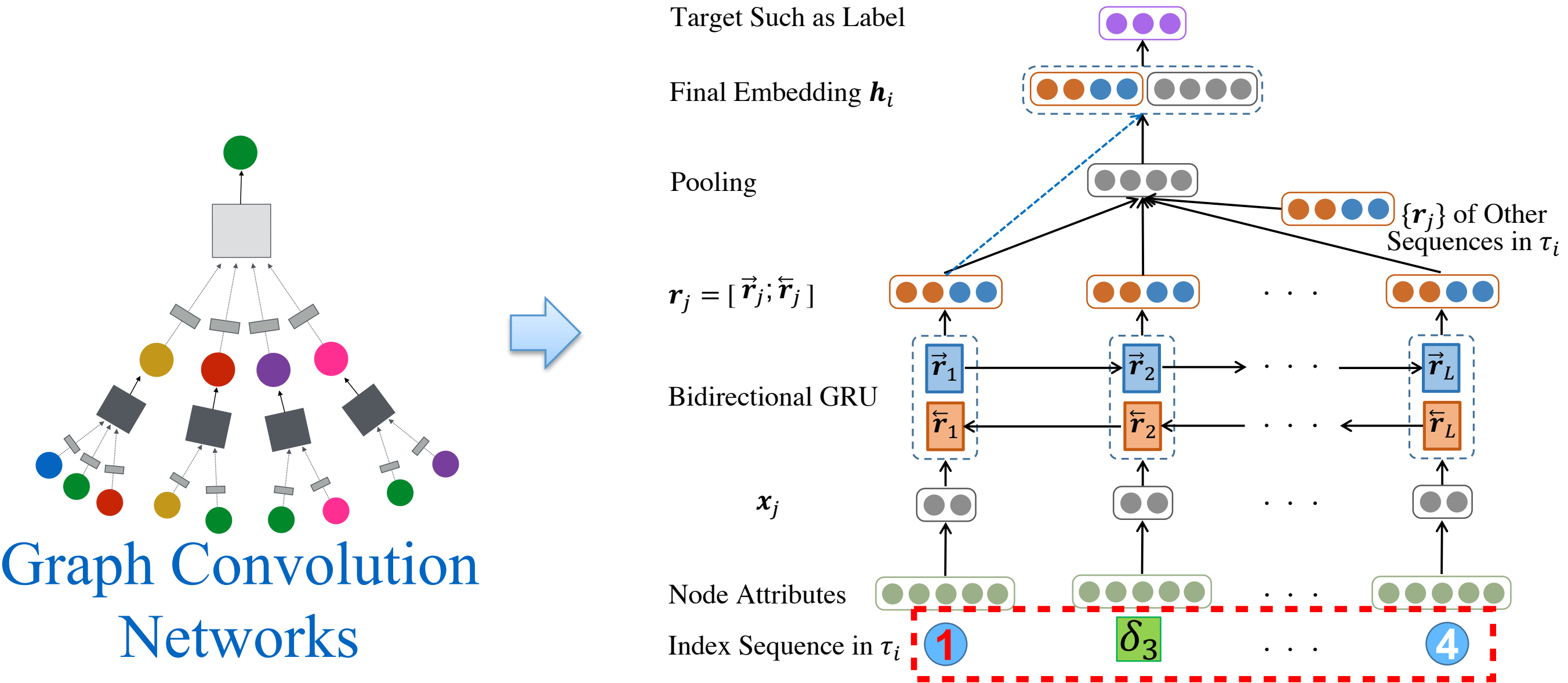
- Consider node attributes as a bipartite network.

Joint Walking Mechanism: AttriWalk



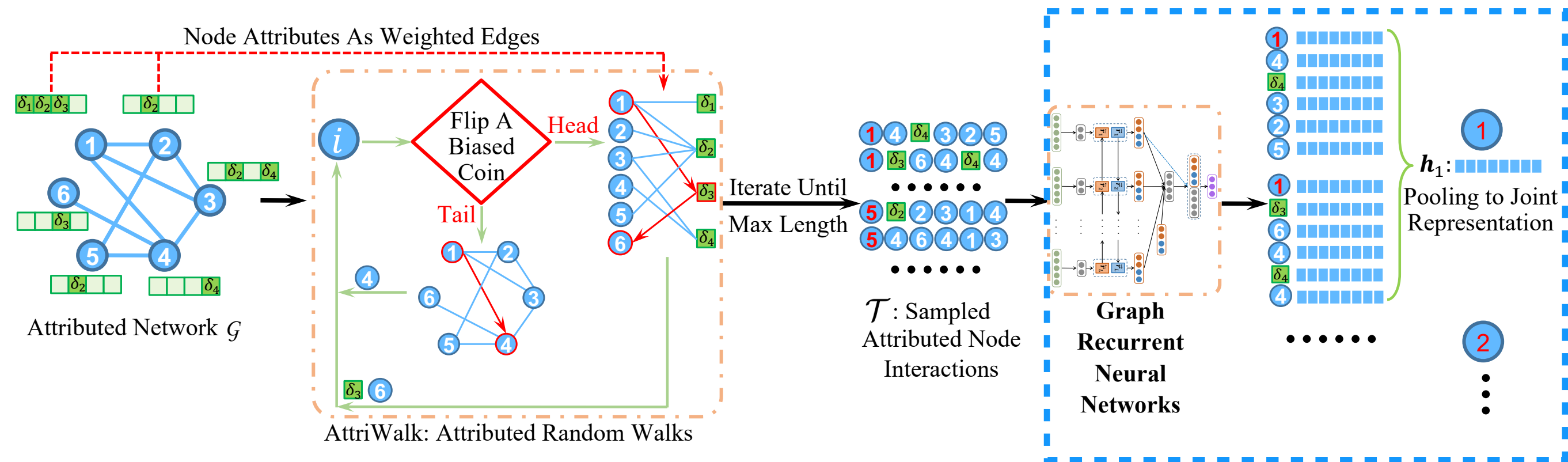
- Consider node attributes as a bipartite network.
- Use it to propel the walking more diverse and mitigate tendency of converging to nodes with high centralities.

Graph Recurrent Networks



- Advance graph convolution nets to graph recurrent nets.
- Empower node representations to interact in the same way as nodes interact in the original attributed network.

Graph Recurrent Networks with Attributed Random Walks



- Convert the complex attributed node interactions into a series of informative node sequences based on AttriWalk.
- Encode them into unified vector representations via graph recurrent networks.