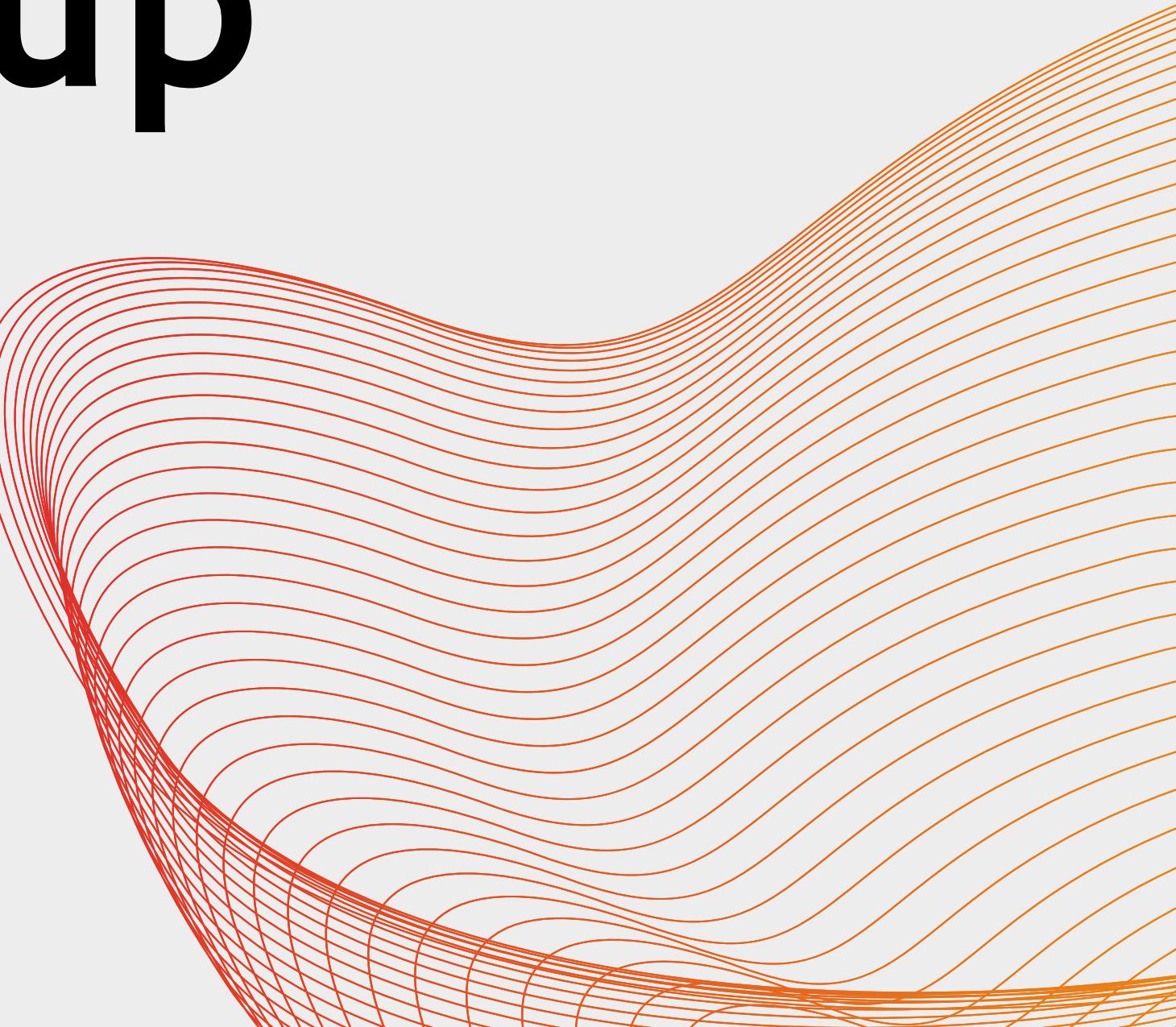




# Network Analysis on Terrorist Group Identification

Group 404 !





# Problem Statement

Based on the past interaction between countries and organizations, develop a model to predict future interactions between these entities. It should be able to predict which countries are likely to be attacked by which terrorist organizations.





# Dataset

	A	B	C	D
1	gname	country_txt	attacktype1_txt	
2	MANO-D	Dominican Republic	Assassination	
3	23rd of September Communist League	Mexico	Hostage Taking (Kidnapping)	
4	Black Nationalists	United States	Armed Assault	
5	Tupamaros (Uruguay)	Uruguay	Assassination	
6	New Year's Gang	United States	Facility/Infrastructure Attack	
7	New Year's Gang	United States	Facility/Infrastructure Attack	
8	Weather Underground, Weathermen	United States	Bombing/Explosion	
9	Left-Wing Militants	United States	Facility/Infrastructure Attack	
10	Left-Wing Militants	United States	Facility/Infrastructure Attack	
11	Armed Commandos of Liberation	United States	Facility/Infrastructure Attack	
12	Commune 1	East Germany (GDR)	Bombing/Explosion	
13	Black Nationalists	United States	Bombing/Explosion	
14	Strikers	United States	Bombing/Explosion	
15	Black Nationalists	United States	Facility/Infrastructure Attack	
16	Black Nationalists	United States	Facility/Infrastructure Attack	
17	Tupamaros (Uruguay)	Uruguay	Armed Assault	
18	Black Nationalists	United States	Bombing/Explosion	
19	Student Radicals	United States	Bombing/Explosion	
20	White supremacists/nationalists	United States	Facility/Infrastructure Attack	
21	Armed Forces of National Liberation- Venezuela	Venezuela	Hostage Taking (Kidnapping)	
22	Strikers	United States	Bombing/Explosion	
23	White supremacists/nationalists	United States	Facility/Infrastructure Attack	

@reallygreatsite



# Points Considered After Midsem

- Bipartite prediction from country to organization based on attack type using sna
- Considered SNA features in Machine learning prediction





# Graph

## Bipartite Graph

**Nodes:**

Country

Terrorist Organization

**Edge:**

country attacked by the organization



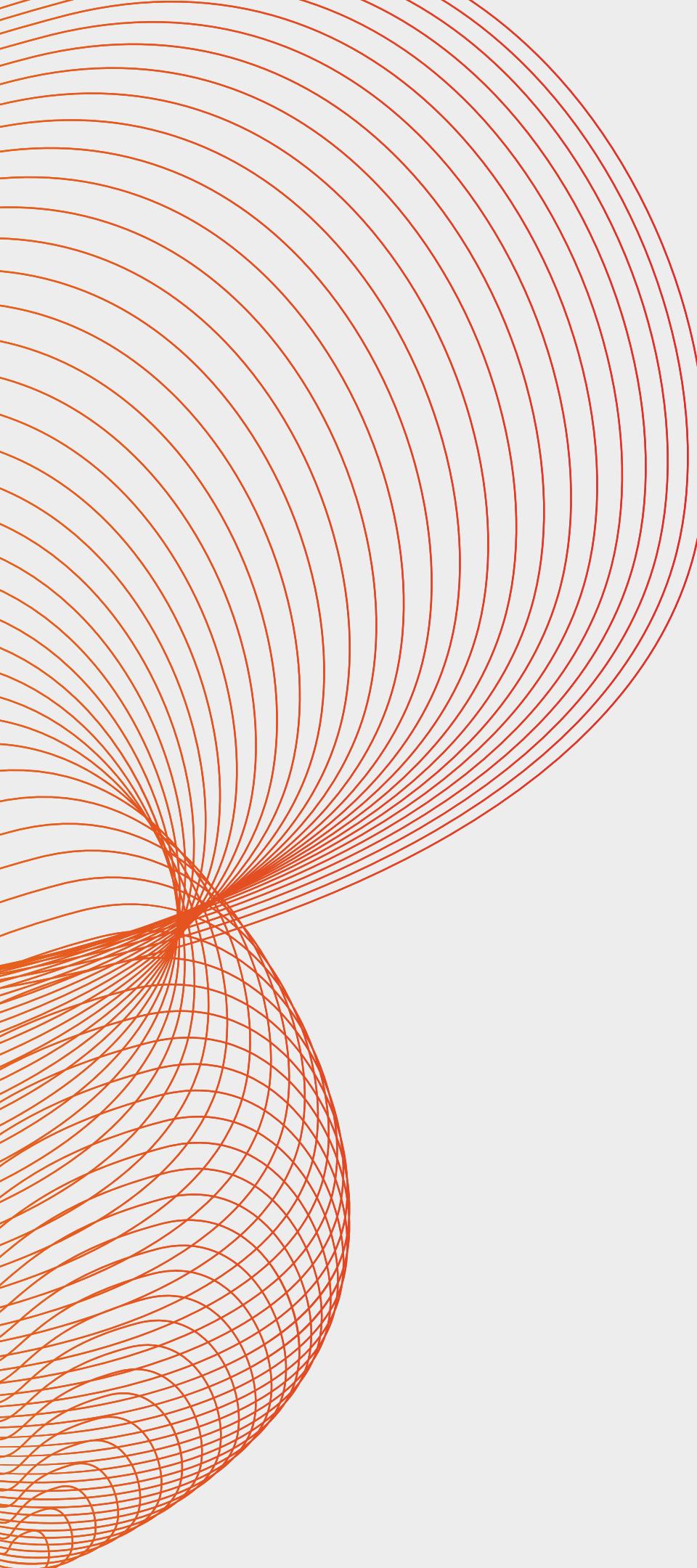
# Methodology

- Bipartite link prediction using spectral curve fitting
- Analysis of the model
- Bipartite link prediction using Machine Learning Model



# Results (Spectral Curve Fitting)

[https://colab.research.google.com/drive/1CNcO\\_RQYqZymhGaViMI9MggmlF1rLx8?usp=sharing](https://colab.research.google.com/drive/1CNcO_RQYqZymhGaViMI9MggmlF1rLx8?usp=sharing)



# Inferences

- **prediction:** few organization attack larger number of countries
- countries can predict the future plans to fight against terrorism
- Identify opportunities for collaboration between countries
- countries can predict the potential collaboration between terrorist organizations

# Analysis of the Model

**Precision:** 0.7980000167502784

proportion of predicted link that are  
actually correct: 80 %

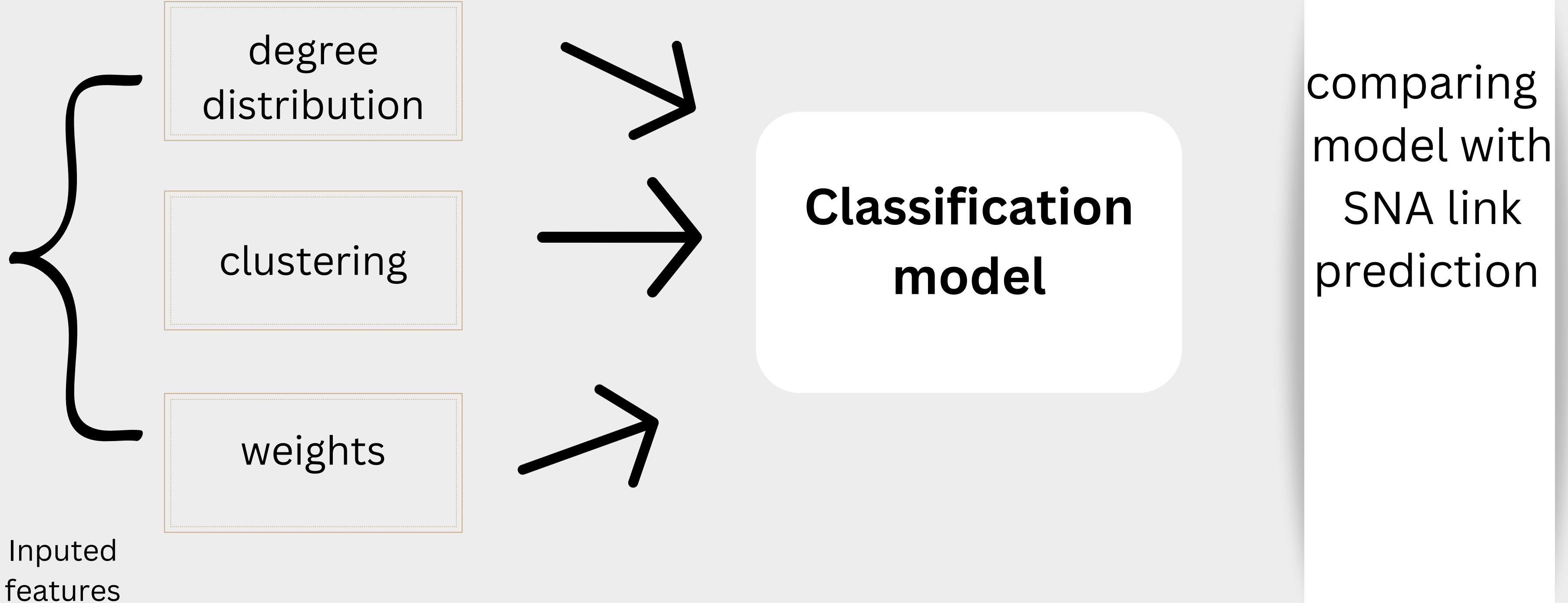
**Recall:** 0.47641238206191033

proportion of actual links that are correctly  
predicted: 47.64 %

**F1-score:** 0.5966311834690045

balanced measure of the model's  
performance: 59.66 %

# (Machine Learning)



# (Machine Learning)

**Random Forest**

Accuracy:

95.89

**Decision tree  
classifier**

Accuracy: 90.211

**logistic regression**

Accuracy: 37.52

# Results (Machine Learning)

<https://colab.research.google.com/drive/17U1kbFHztbuPfTvVnzIxksaQoo9Ik46J?usp=sharing>

# Inference



Why logistic regression didnt work?

Why random forest performed well and able to predict class well?

Why accuracy of model were better with SNA parameters compare to statistical parameters?



# Things that didn't work

@reallygreatsite



# Link Prediction

- Jaccard coefficient
- Adamic Adar index

[https://colab.research.google.com/drive/1X4PVNF2aybuO\\_Fp2Ft11jVsiR\\_4ZzdLG?usp=sharing](https://colab.research.google.com/drive/1X4PVNF2aybuO_Fp2Ft11jVsiR_4ZzdLG?usp=sharing)



# Problems

- Designed for unipartite
- provide self links only
- can't be applied to bipartite



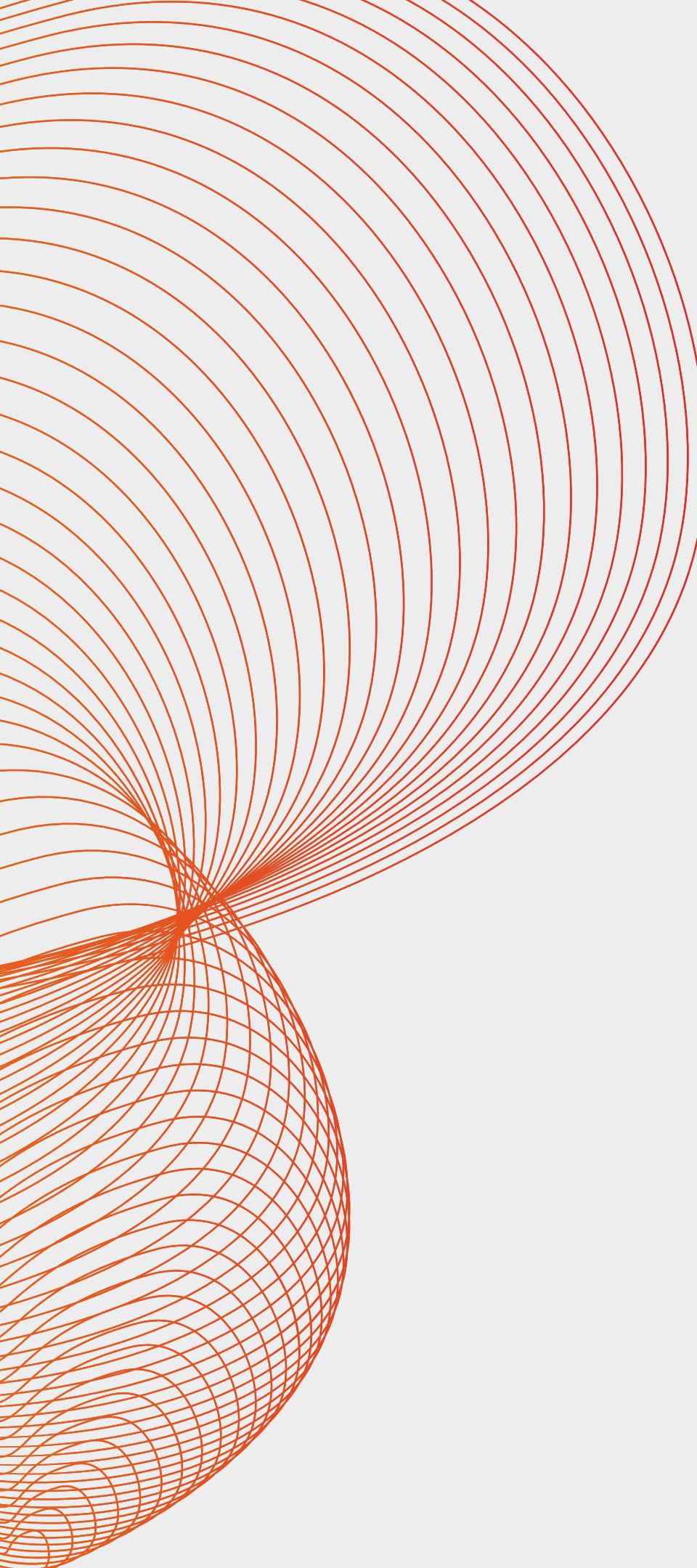
# Link Prediction using preferential attachment

[https://colab.research.google.com/drive/1zUWq2H5wPI\\_CNEsgEIUrderxeQ5He0j-r?usp=sharing](https://colab.research.google.com/drive/1zUWq2H5wPI_CNEsgEIUrderxeQ5He0j-r?usp=sharing)



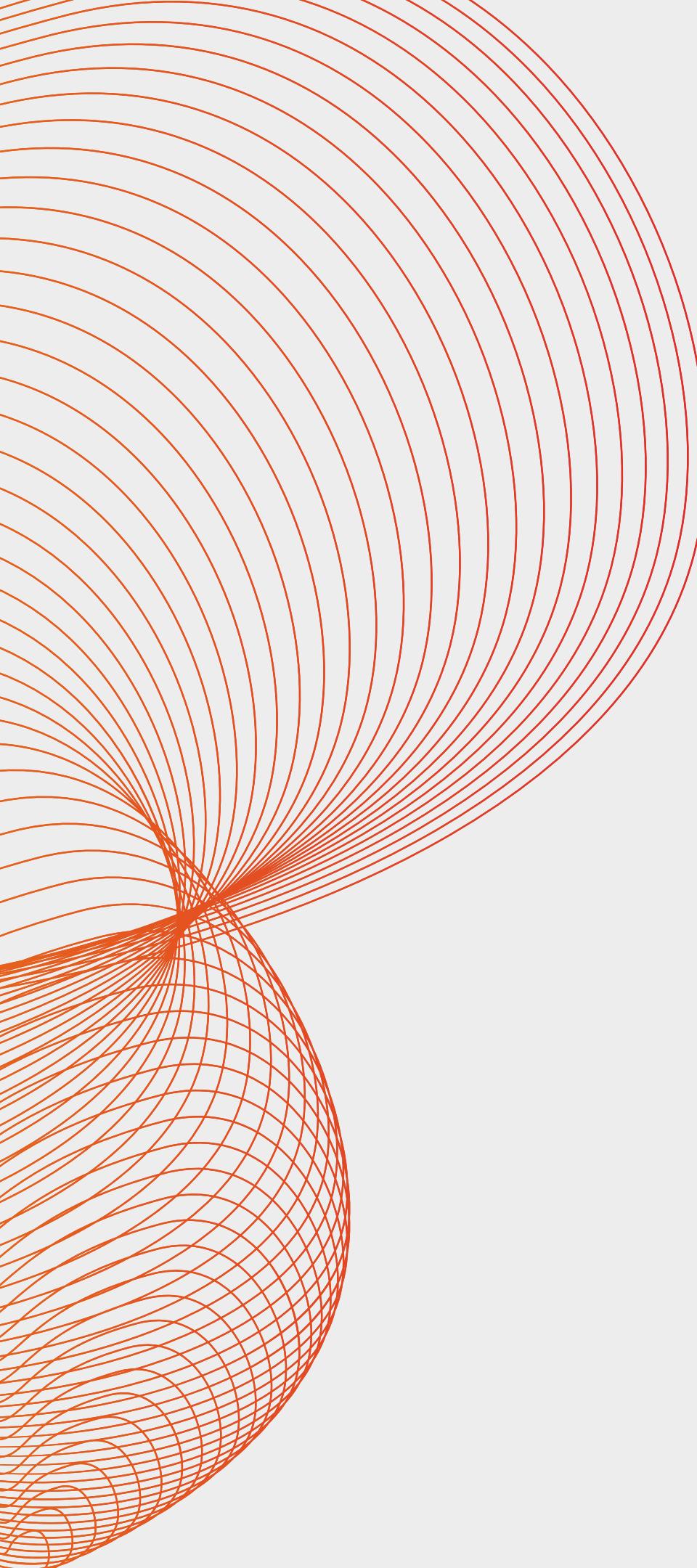
# Problems

- Designed for unipartite
- provide self links only
- can't be applied to bipartite



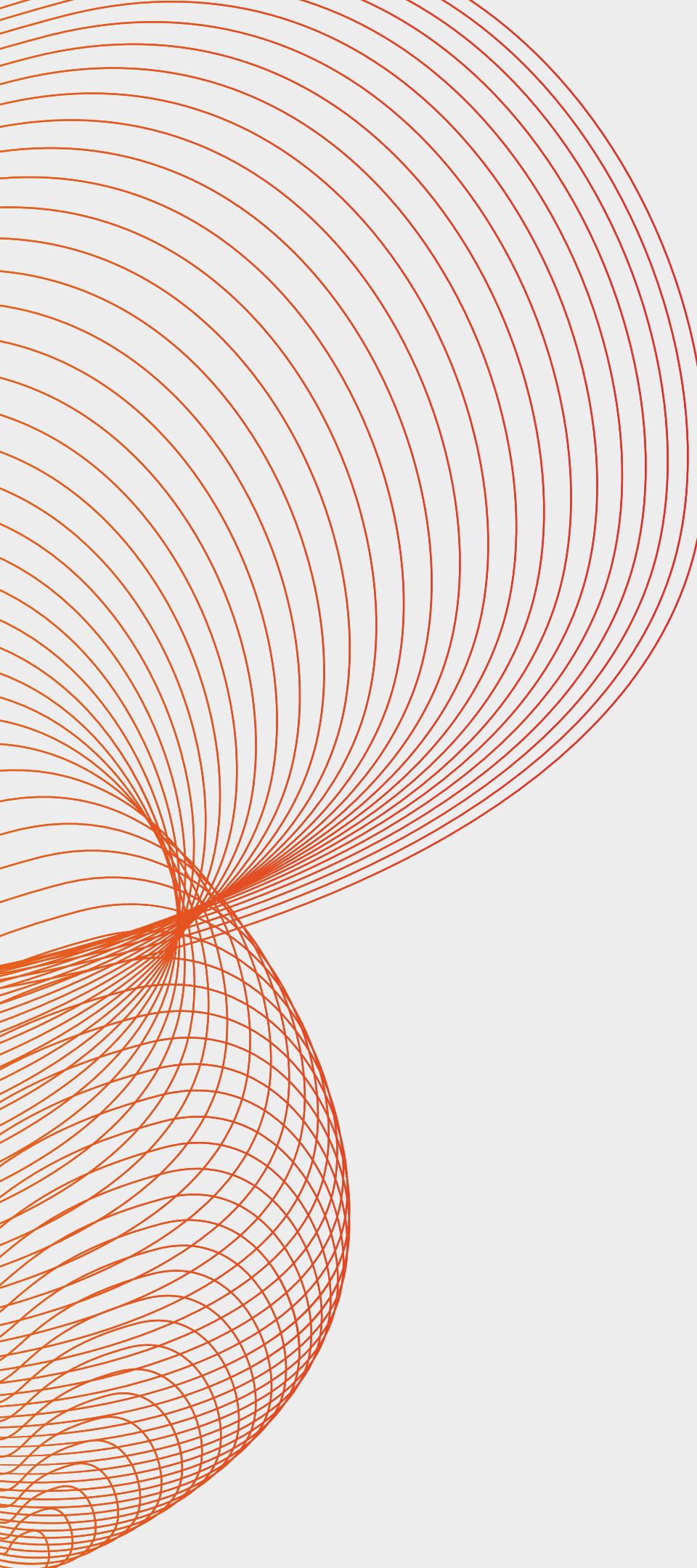
# How to install and implement the project

- Go to github repository
  - create a csv file with two columns country, terrorist specifying bipartite graph
  - Run `Terrorist_Attack_Prediction.py` file
- 



# How to install and implement the project

- Output will be generated in predicted\_links.csv file
  - To Evaluate the model, run evaluation.py file
  - It will be required both input and output file as input
- 



# How to install and implement the project

- For ML model, download ML\_Prediction.py file
- create a csv file and run the model

# Work Distribution



**Utsav Vithlani:** Link Prediction using Spectral Curve Analysis

**Dhanya Mehta:** identification of organization using Machine Learning

**Raj Patel:** Link Prediction using jaccard coefficient, adamic-adar index

**Dhyey Patel:** Link Prediction using preferential attachment, bipartite modularity optimization(didn't work)



# Thank You

