

# Advancements in Machine Learning Algorithms for Generating Secure and Efficient Path

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## ARTICLE INFO

### Article History:

Accepted: 10 Oct 2023

Published: 30 Oct 2023

### Publication Issue

Volume 9, Issue 10

September-October -2023

### Page Number

57-61

## ABSTRACT

Now days the security of person is huge concern when it travelling new regions, where People use Google map to find Shortest path to her designation. But Map are only providing Shortest path it ignores the security aspect of People. So we use trending Machine Learning technique to overcome this issue.

In traditional path planning algorithm, it in this project, were view recent advances in shortest path finding in complex graph, focusing primarily on Neural Network, Genetic Algorithm. We discuss the application of these techniques to provide Security along with Shortest path. The project's key concept is integrating GNN model with Genetic algorithm to work on complex graphs and learning Security-related features from dataset. GNN model insights are used in Genetic algorithm to Path investigation.

**Keywords:-** Machine Learning, Graph Neural Network, Genetic Algorithm, Risk identification, Secure path, Shortest path problem, Risk assessment.

## I. INTRODUCTION

Recent year criminal activities are rapidly increases against people when it travelling in urban areas like harassment, Kidnapping. Early prediction and detection of secure path are crucial to provide secure and shortest path to designation in urban areas [1]. AI based path planning algorithm are alternatives of traditional method by providing more efficient and fast generating in complex environments [2]. Using Neural Network Encoder improve the efficiency of path planning algorithm by eliminate fixed and dynamic obstacles which may help to generate route [3].

This paper explores the shortest path planning and framework builds on a line of work on GNNs model [4]. By using capabilities of deep learning algorithms for shortest path planning in complex environments, we aim to develop a robust and efficient application that can assist people to navigate the secure path in urban areas, ultimately enhancing the efficiency of path planning and increasing the security of routes.

In this paper, we introduce our approach, methodology to use deep learning models to generating route in complex environment along with security. Our model consists the combination of two algorithms first one is Graph Neural Network and second is Genetic Algorithm. Graph Neural Network takes historical data as input and predict risk factor and Genetic algorithm takes predicted value of GNNs and distance between Nodes to shortest path planning along with secure path. This approach provides secure and shortest path planning so it will helpful to reduce street harassment cases.

## II. REVIEW / LITERATURE SURVEY OF CONFERENCE/JOURNAL PAPERS SUP-PORTING PROJECT IDEA

Paper1:” PREVENTION OF STREET HARASSMENT THROUGH CONSTRAINED SHORTEST PATH ALGORITHMS”-Isabel Mora, Andrea Serna, Mauricio Toro

In this paper, it introduces modified version of Dijkstra’s algorithm to solve street sexual harassment problem in cities. They choose Dijkstra’s algorithm to handle large map, two approaches are used to build algorithm first one to find shortest path without concerning about security and second design algorithm which find lowest risk of harassment without concerning about distance.

Paper 2:” Comparative Analysis of Path Planning Algorithms and Prospects for Practical Application”- YihanKe\* In this paper, it present the AI-based path planning algorithms are alternatives of traditional algorithms of path planning by providing efficient solution in complex environments. Research in AI continues so further improvements in path planning algorithms, to increase its application in real World.

Paper3:” Performance Improvement of Path Planning algorithms with Deep Learning Encoder Model”- Janderson Ferreira, Agostinho A.F. Junior, Yves M. Galvao, Pablo Barros

This study investigate that CNN Encoder is used to improve performance of path planning algorithm along with traditional algorithm. They propose the CNN Encoder techniques to reduce response time for path planning by reduce fixed and dynamic obstacles. Future work they intend to combine new Deep Learning algorithm to increase efficiency and reduce response time event.

Paper4:” Shortest Path Networks for Graph Property Prediction”-Ralph Abboud, Radoslav Dimitrov, Ismail Ilkan Ceylan

This paper presents the SPMPNNS (shortest path message passing Neural network) framework is to update state by aggregating message from shortest path neighbourhood. This framework work on GNNs using multi-hop aggregation.

Paper 5:” A review: On path planning strategies for navigation of mobile robot”-B.K. Patle, Ganesh Babu L, Anish Pandey, D.R.K. Parhi, A. Jagadeesh

This paper explores the algorithm based on its prior knowledge and classified algorithm into two parts global and local navigation, where global navigation work on prior information of obstacles and local navigation ignore the previous information. This study explain reactive algorithms are better performance than traditional method in complex environments.

Paper 6:” Dynamic Path Planning Algorithms with Load Balancing Based on Data Prediction for Smart Transportation Systems”-NINGSUN1, HUIZHUSHI, GUANGJIEHAN, BINWANG1, ANDLEISHU  
In this paper, model predict the traffic condition of road based on historical traffic information and provide the path with shortest travel time. Model work on predicted information and available route to plan path and it respond in large environments also.

Paper 7: Dynamic Shortest Path Routing In Mobile Adhoc Networks Using Modified Artificial Bee Colony Optimization Algorithm E. Hemalatha Jai Kumari, Dr. Kannammal  
This paper investigates the shortest path in topological routing and proposed model overcome all problems and work in dynamic and static environments. It stores the previous step gain information for optimization. Modified Artificial Bee Colony optimization performance better than Artificial Bee Colony optimization in dynamic environments.

Paper 8:” Solving Shortest Path Problems Using Genetic Algorithms” Shatha Abdullah Rasheed.  
This paper explores use of genetic algorithm to find shortest path by using their flexibility and robustness. Genetic algorithm has ability to work without prior knowledge. In Future work using some intelligent approaches and combine algorithm performance of algorithm is improved.

Paper 9: SPGNN-API: A Transferable Graph Neural Network for Attack Paths Identification and Autonomous Mitigation-Housseem Jmal, Firas Ben Hmida, Nardine Basta, Muhammad Ikram, Mohamed Ali Kaafar and Andy Walker  
This study proposed the model which work on detection of malicious activities using Graph Neural Network-API by autonomous identification of potential attacks. GNN-based approaches are self adaptive to dynamic environments. The work fills gap between GNN-based approaches to risk assessments, attack path identification.

Paper 10: Risk-Aware Travel Path Planning Algorithm Based on Reinforcement Learning during COVID-19 -Zhijian Wang, Jianpeng Yang, Qiang Zhang and Li Wang  
In this paper the Reinforcement learning model is used to path planning for travelling in city during pandemic situation to avoid risk in traffic and learning model improve efficiency of potential field. The model and algorithm is used to secure travel path planning in pandemic situation.

### III. LIMITATION OF EXISTING WORK

- Data Availability: Street Criminal Activities and Harassment datasets are relatively small or not available, so GNNs model required large labelled graph data to train model.
- Complexity: Compute both secure and shortest path required more time specially in large graph. Many traditional algorithms required computational time to compute shortest path in dynamic environments.
- Balancing: In traditional method it computes only security or shortest path, if it provides both aspect than balancing between security and shortest path is difficult task. When algorithm provide security than it impacts on efficiency of algorithm.

- Scalability: Many traditional algorithms become inefficient when size of nodes and edges are increased in large graph.
- Dynamic Environment: Dynamic environment reduces the efficiency of traditional algorithms and it works on static environment size of nodes and edges increases than it is challenging for many algorithms to maintain efficiency.
- Privacy Concerns: When security is provided along with path planning involves analyzing data and it may create privacy concerns.
- LPR in modern transport systems identifies vehicles via computer vision. Our novel SR algorithm improves license plate legibility in traffic videos. [11]

#### IV. CONCLUSION

The use of deep learning algorithms for path planning improves the performance and reduces the time required to proceed in complex environments. Graph Neural Network is more capable to handle complex graph data rather than Conventional neural network. Using GNNs and GN enhanced security measures along with efficient navigation. This approach has capability to address complex problem which requires balancing between security and efficiency.

In traditional method of path planning is not working properly in complex environment and it doesn't provide heuristic cost. Our approach is to use deep learning algorithm to compute shortest and risk free path by using historical data about routes.

Our model contains two main algorithms: First GNNs algorithm calculate the predicted weight for each node in graph and second genetic algorithm uses predicted weight of each node as heuristic cost, implements the shortest distance between two nodes with risk identification. One of the key components of our system is that graph neural network model can handle complex environment and predict the risk factor of each route in advance.

#### V. REFERENCES

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