

इंडियन इंस्टीट्यूट ऑफ टेक्नोलॉजी दिल्ली
हौज खास, नई दिल्ली -110016
(औद्योगिक अनुसंधान एवं विकास इकाई)
INDIAN INSTITUTE OF TECHNOLOGY DELHI
Hauz Khas, New Delhi-110016
(Industrial Research & Development Unit)

No. IITD/IRD/RP04938G/ 77259

Dated:01/03/2025

Advertisement No.: IITD/IRD/061/2025

Applications from Indian nationals are invited for Project Appointment under the following project. Appointment shall be on contractual basis with consolidated pay, renewable yearly or upto the duration of the project, whichever is earlier. निम्नलिखित परियोजना के तहत भारतीय नागरिकों से आवेदन आमंत्रित किए जाते हैं। अपॉइंटमेंट, अनुबंधित आधार पर समेकित वेतन, नवीकरणीय वार्षिक या परियोजना की अवधि तक, जो भी पहले हो, के साथ होगा।

Project description We plan to investigate game theoretic problems from an uncertain environment using recent advances in neurodynamic optimization models coupled with deep neural networks and physics informed neural networks (PINNs). The uncertainties can be present in the players' cost functions and the strategy sets. An expected value criterion is used to model the cost function of a risk-neutral player whereas the quantile-based criterion is used when the player is risk-averse. The random constraints present in the strategy sets are modeled using joint chance constraints where dependency structure is driven by a copula. The new game theoretic formulation is called chance-constrained game which mainly captures static situations. When the underlying system evolves over a period of time, Markov decision processes (MDPs) are used as a decision making framework. The running costs and transition probabilities are the model parameters of MDP problem and are assumed to be known in general. However, in real life situations these parameters are not exactly known and often estimated from past data which might lead to erroneous policy decisions. Some research has been done on uncertain MDP problems using robust optimization and chance constrained optimization framework. We use an extended MDP framework which can accommodate multi-player decision making. Such games are called stochastic dynamic games and to the best of our knowledge they have not been explored much when running costs and transition probabilities are uncertain. The conventional approaches proposed for chance-constrained games and uncertain MDPs are often time consuming for large size instances. Our first objective in this project is to come up with an equivalent neurodynamic optimization model which is globally convergent. Later we integrate the neurodynamic model with deep neural networks and PINNs to predict accurate solutions of the game and MDP problems. Our second objective of the project is to model stochastic dynamic game problems under uncertain costs and transition probabilities using robust and chance constraint optimization, and design equivalent neurodynamic optimization model which can be integrated with the deep neural networks and PINNs in order to predict the accurate solutions of the stochastic game problems. Our third objective is to apply our models to the energy management problems. Cournot competition models and portfolio selection problems. To test the efficacy, we perform training and testing of neural networks using available real-data sets. The major advantage of using neural network based approaches over conventional approaches is that they can be made scalable with the help of advanced machine learning algorithms.

Title of the Project	Stochastic Games Inspired Neural Networks (GINNs). (RP04938G)	
Funding Agency	IFCPAR	
Name of the Project Investigator	Prof. Vikas Vikram Singh [email ID: vikassingh@iitd.ac.in]	
Deptt./ Centre	Dept. of Mathematics	
Duration of the Project	Upto:29/02/2028	
Post (s)	Consolidated fellowship / Pay-slab	Qualifications
Research Associate (1)	Rs.58,000/-p.m. plus HRA @ 27%	Candidates with PhD degree in Mathematics, Operations Research, Computer Science and related areas. The candidates with background in stochastic games and stochastic optimization will be preferred.

The post may be downgraded as per discretion of the Selection Committee if none of the candidate is found suitable for the post.

The candidates who are interested to apply for the above post should download **Form No. IRD/REC-4** from the IRD Website (<http://ird.iitd.ac.in/rec>) of IIT Delhi and submit the duly filled form with complete information regarding educational qualifications indicating percentage of marks/division, details of work experience etc. **by e-mail with advertisement No. on the subject line to Prof. Vikas Vikram Singh at email id: vikassingh@iitd.ac.in** The CV must contain the names of at least two academic referees who can be contacted for recommendation letter.

IIT Delhi reserves the right to fix higher criteria for short-listing of eligible candidates from those satisfying advertised qualification and requirement of the project post and their name will be displayed on web link (<http://ird.iitd.ac.in/shortlisted>) alongwith the online interview details. Only short-listed candidates will be informed for online interview. In case any clarification is required on eligibility regarding the above post, the candidate may contact **Prof. Vikas Vikram Singh at email id: vikassingh@iitd.ac.in**

5% relaxation of marks may be granted to the SC/ST Candidates. In case of selection of a retired/superannuated government employee, his/her salary will be fixed as per prevailing IRD norms. अनुसूचित जाति / अनुसूचित जनजाति के उम्मीदवारों को अंकों की 5% छूट दी जा सकती है. एक सेवानिवृत्त सरकारी कर्मचारी के चयन के मामले में उसका वेतन वर्तमान आईआरडी मानदंडों के अनुसार तय किया जाएगा **The last date for submitting the completed applications by e-mail is 17/03/2025 by 5.00 p.m.**

17/03/2025

उप कुलसचिव, आईआरडी

वितरण

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