

Self-introduction

Researcher : Minh-Tu Cao (高明秀)

Institution : 陽明交通大學

Department : 土木工程學系



Career Milestones

台科大
營建工程系



Full scholarship
in English
Ph.D. Program

榮工公司
技術處



Site Control
Engineer in Liwa
Project - Oman

明新科大
土環系



Assist. Prof.
2022/9 – present

Received 7/10
semesters scholarship

Bachelor

2005/9 – 2010/8

2010/9 – 2012/7

Master

Full scholarship
in English
Master Program

Ph.D.
2012/9 – 2015/6



2015/7 – 2016/8

BIM Engineer

Site Engineer

2016/9 – 2019/1



2019/2 – 2022/1

Assist. Prof.

An official staff
since 2021/8



越南土木大學
土木系

台科大
營建工程系

中鼎集團
營運部

陽明交大
土木系

Optimization problems in CEM

- Time–cost–quality tradeoff
- RCPSP
- Cost of concrete mixture
- Labor / resource mobilization
- Building design with energy efficiency
- *Etc.*

Machine learning

Estimation and classification in CEM

- Score depth surrounding bridge pier
- Mechanical behaviors of RC components
- Energy consumption / demand
- Construction cost index
- Damage / defect classification
- *Etc.*

AI in Civil and Construction Engineering & Management

Metaheuristic algorithm

Deep learning-based computer vision

Detection / Segmentation of defected areas in CEM

- Road Surface damages
- Concrete spalling
- Defected façade
- Real-time supervising workers on site
- Safety control
- Equipment's operation
- *Etc.*

Building Information Modeling (BIM)

SERVE IN NYCU (2021/2 TO PRESENT)

Awarded Conference Papers

- 鄭皓中、王世旭、張智安、高明秀、王維志，運用BIM與電腦視覺及物件偵測技術於工程進度追蹤，2022第26屆營建工程與管理學術研討會論文集，台灣中壢(中央) (**Outstanding Paper Award**)
- 芫毅 趙, 乃文 紀, 紹偉 翁, 世昕 陳, 裕仁 鄭, 明秀 高, 維志 王, 運用建築資訊模型(BIM)以輔助查核營建工程估驗計價，2023第27屆營建工程與管理學術研討會論文集，台灣新竹(陽明交大) (**Outstanding Paper Award**)

Awarded Competition

- 中國土木水利工程學會所舉辦的「2022學生BIM軟體應用競賽」中獲得第二名，

SERVE IN NYCU (2021/2 TO PRESENT)



1. 應用影像處理與詮釋啟發最佳化機器學習演算法於鋼筋混凝土剝落自動化辨識

✓ 2020/08/01 ~ 2021/07/31

✓ 主持人

2. 應用多超參數最佳化策略強化極限梯度提升(Extreme Gradient Boosting)於貫穿剪力強度之預測能力

✓ 2023/08/01 ~ 2024/07/31

✓ 主持人

3. 瀏覽器可訪問的機器學習系統用於預測混凝土和鋼結構的強度

✓ 2023/08/01 ~ 2024/07/31

✓ 共同主持人

4. 結合圖像分割技術之單階深度學習檢測器應用於檢測及描繪建築物外牆瓷磚剝落區域

✓ 2022/08/01 ~ 2023/07/31

✓ 主持人

PUBLICATIONS IN SCI JOURNALS

- [1] N.-M. Nguyen, W.-C. Wang, and **M.-T. Cao***, "Early estimation of the long-term deflection of reinforced concrete beams using surrogate models," *Construction and Building Materials*, vol. 370, p. 130670, 2023/03/17/ 2023, doi: <https://doi.org/10.1016/j.conbuildmat.2023.130670>. (Corresponding author)
- [2] M.-Y. Cheng, **M.-T. Cao***, and N.-M. Dao-Thi, "A novel artificial intelligence-aided system to mine historical high-performance concrete data for optimizing mixture design," *Expert Systems with Applications*, vol. 212, p. 118605, 2023/02/01/ 2023, doi: <https://doi.org/10.1016/j.eswa.2022.118605>. (Corresponding author)
- [3] H. Nguyen, **M.-T. Cao**, X.-L. Tran, T.-H. Tran, and N.-D. Hoang, "A novel whale optimization algorithm optimized XGBoost regression for estimating bearing capacity of concrete piles," *Neural Computing and Applications*, 2022/10/15 2022, doi: 10.1007/s00521-022-07896-w.
- [4] **M.-T. Cao**, N.-M. Nguyen, and W.-C. Wang, "Using an evolutionary heterogeneous ensemble of artificial neural network and multivariate adaptive regression splines to predict bearing capacity in axial piles," *Engineering Structures*, vol. 268, p. 114769, 2022/10/01/ 2022, doi: <https://doi.org/10.1016/j.engstruct.2022.114769>.
- [5] M.-Y. Cheng, **M.-T. Cao***, and C. K. Nuralim, "Computer vision-based deep learning for supervising excavator operations and measuring real-time earthwork productivity," *The Journal of Supercomputing*, 2022/09/27 2022, doi: 10.1007/s11227-022-04803-x. (Corresponding author)
- [6] W.-C. Wang, N.-M. Nguyen, and **M.-T. Cao***, "Smart ensemble machine learner with hyperparameter-free for predicting bond capacity of FRP-to-concrete interface: Multi-national data," *Construction and Building Materials*, vol. 345, p. 128158, 2022/08/22/ 2022, doi: <https://doi.org/10.1016/j.conbuildmat.2022.128158>. (Corresponding author)
- [7] M.-Y. Cheng, **M.-T. Cao***, and I. F. Huang, "Hybrid artificial intelligence-based inference models for accurately predicting dam body displacements: A case study of the Fei Tsui dam," *Structural Health Monitoring*, vol. 21, no. 4, pp. 1738-1756, 2022/07/01 2021, doi: 10.1177/147592172111044116. (Corresponding author)
- [8] H. Nguyen, N.-M. Nguyen, **M.-T. Cao**, N.-D. Hoang, and X.-L. Tran, "Prediction of long-term deflections of reinforced-concrete members using a novel swarm optimized extreme gradient boosting machine," *Engineering with Computers*, vol. 38, no. 2, pp. 1255-1267, 2022/06/01 2022, doi: 10.1007/s00366-020-01260-z.
- [9] **M.-T. Cao**, K.-T. Chang, N.-M. Nguyen, V.-D. Tran, X.-L. Tran, and N.-D. Hoang, "Image processing-based automatic detection of asphalt pavement rutting using a novel metaheuristic optimized machine learning approach," *Soft Computing*, vol. 25, no. 20, pp. 12839-12855, 2021/10/01 2021, doi: 10.1007/s00500-021-06086-5.

PUBLICATIONS IN SCI JOURNALS

- [10] **Cao, M.-T.**, N.-M. Nguyen, K.-T. Chang, X.-L. Tran and N.-D. Hoang (2021). "Automatic recognition of concrete spall using image processing and metaheuristic optimized LogitBoost classification tree." *Advances in Engineering Software* 159: 103031.
- [11] M.-Y. Cheng, **M.-T. Cao***, and A. Y. Jaya Mendrofa, "Dynamic feature selection for accurately predicting construction productivity using symbiotic organisms search-optimized least square support vector machine," *Journal of Building Engineering*, vol. 35, p. 101973, 2021/03/01/ 2021, doi: <https://doi.org/10.1016/j.jobe.2020.101973>. (Corresponding author)
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- [13] H. Nguyen, N.-M. Nguyen, **M.-T. Cao**, X.-L. Tran, and N.-D. Hoang, "Prediction of Long-Term Deflections of Reinforced Concrete Members Using a Novel Swarm Optimized Extreme Gradient Boosting Machine," *Engineering with Computers*, vol. In Press, 12/22 2020.
- [14] M.-Y. Cheng, **M.-T. Cao***, and P.-K. Tsai, "Predicting load on ground anchor using a metaheuristic optimized least squares support vector regression model: a Taiwan case study," *Journal of Computational Design and Engineering*, vol. 8, no. 1, pp. 268-282, 2020, doi: 10.1093/jcde/qwaa077. (Corresponding author)
- [15] M.-Y. Cheng, **M.-T. Cao***, and J. G. Herianto, "Symbiotic organisms search-optimized deep learning technique for mapping construction cash flow considering complexity of project," *Chaos, Solitons & Fractals*, vol. 138, p. 109869, 2020/09/01/ 2020, doi: <https://doi.org/10.1016/j.chaos.2020.109869>. (Corresponding author)
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- [17] **M.-T. Cao**, N.-D. Hoang, V. H. Nhu, and D. T. Bui, "An advanced meta-learner based on artificial electric field algorithm optimized stacking ensemble techniques for enhancing prediction accuracy of soil shear strength," *Engineering with Computers*, 2020/11/02 2020, doi: 10.1007/s00366-020-01116-6.
- [18] M.-Y. Cheng, J.-S. Chou, and **M.-T. Cao***, "Nature-inspired metaheuristic multivariate adaptive regression splines for predicting refrigeration system performance," *Soft Computing*, vol. 21, no. 2, pp. 477-489, 2017/01/01 2017, doi: 10.1007/s00500-015-1798-y. (Corresponding author)
- [19] D.-H. Tran, M.-Y. Cheng, and **M.-T. Cao**, "Solving Resource-Constrained Project Scheduling Problems Using Hybrid Artificial Bee Colony with Differential Evolution," *Journal of Computing in Civil Engineering*, vol. 30, no. 4, p. 04015065, 2016/07/01 2016, doi: 10.1061/(ASCE)CP.1943-5487.0000544.
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- [21] M.-Y. Cheng and **M.-T. Cao***, "Estimating strength of rubberized concrete using evolutionary multivariate adaptive regression splines," *Journal of Civil Engineering and Management*, vol. 22, no. 5, pp. 711-720, 2016/07/03 2016, doi: 10.3846/13923730.2014.897989. (Corresponding author)
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PUBLICATIONS IN CONFERENCES

- [1] K. T. Chang, Y. S. Chiang, **M. T. Cao**, C. T. Wang, Analyzing Pre- and Post-Earthquake Changes using Optical and SAR Satellite Images, CORECT-IJSS 2019 International Conference on Sustainability Science and Management: Advanced Technology in Environmental Research, Bali, Indonesia, Nov. 14-15, 2019.
- [2] K. T. Chang, **M. T. Cao**, Estimating Seismic Retrofitting Cost of Taiwan School Buildings Using AI-Based Inference Models, ICEO-SI 2019, 4th Symposium, Taichung, Taiwan, June 23-26, 2019.
- [3] **Minh-Tu Cao**, Nhat-Duc Hoang, Automatic Recognition of Concrete Spall Using Image Processing and Metaheuristic Optimized LogitBoost Classification Tree, The 24th Symposium Construction Engineering and Management, Taipei, Taiwan, August 05th 2020 4.
- [4] **Minh-Tu Cao**, K.T. Chang, Mohammad Adhan, Multiple Dashcam Image Resource-Trained Deep Learning Models for Enhancing Road Damage Detection, The 24th Symposium Construction Engineering and Management, Taipei, Taiwan, August 05th 2020.
- [5] **Minh-Tu Cao**, N.N. Mai, C.C. Chen Smart Ensemble Hyperparameter-free Machine Learner for Predicting the Bond Capacity of an FRP-to-concrete Interface: Multinational Data, The 26th Symposium Construction Engineering and Management, Zhongli, Taiwan, July 22nd 2022.
- [6] **Minh-Tu Cao**, N.N. Mai, C.C. Chen Predicting the Long-Term Deflection of Reinforced Concrete Beams Using Feature Refinement-Based Self-tuning Machine Learning Model, The 26th Symposium Construction Engineering and Management, Zhongli, Taiwan, July 22nd 2022.
- [7] 鄭皓中、王世旭、張智安、**高明秀**、王維志, 運用BIM與電腦視覺及物件偵測技術於工程進度追蹤, 2022第26屆營建工程與管理學術研討會論文集, 台灣中壢(中央) (Outstanding Paper Award)
- [8] 芫毅趙, 乃文紀, 紹偉翁, 世昕陳, 裕仁鄭, **明秀高**, 維志王, 運用建築資訊模型(BIM)以輔助查核營建工程估驗計價, 2023第27屆營建工程與管理學術研討會論文集, 台灣新竹(陽明交大) (Outstanding Paper Award)
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THANK YOU



Cao Minh Tu
2023/9/28