

Documents

Akbar, M.A.^a, Jazlan, A.^a, Ibrahim, A.M.^a, Ahmad, A.^b

Deep Learning-Based Yield Prediction for the Die Bonding Semiconductor Manufacturing Process
(2024) *Lecture Notes in Electrical Engineering*, 1213 LNEE, pp. 75-82.

DOI: 10.1007/978-981-97-3851-9_7

^a Department of Mechatronics Engineering, Faculty of Engineering, International Islamic University Malaysia, Selangor, Jalan Gombak, 53100, Malaysia

^b Department of Electrical Engineering, Universiti Teknikal Malaysia Melaka, Jalan Hang Tuah Jaya, Melaka, Durian Tunggal, 76100, Malaysia

Abstract

In the semiconductor manufacturing industry, consistently achieving a high yield is the primary target to meet customer demands and ensure continuous profitability. The ability to predict the yield of a particular manufacturing process at either the Front of Line or End of Line facilities is therefore essential in order to analyze Return of Investments (ROI), predictive maintenance and condition monitoring. However, achieving high quality predictions with good accuracy is challenging due to the various uncertainties in the manufacturing process such as unexpected machine downtime and stoppage for maintenance. In this paper we propose a method using Deep Learning Long Short-Term Memory Recurrent Neural Networks (LSTM-RNN) to perform day ahead forecasting of the yield from the Die Bond process at a particular semiconductor manufacturing facility. The method was implemented using MATLAB software, and the results demonstrate that the proposed approach achieves accurate yield forecasts with less than 8% error. Further improvements can be made by utilizing hourly data instead of daily data. © The Author(s), under exclusive license to Springer Nature Singapore Pte Ltd. 2024.

Author Keywords

Die bonding; Long short-term memory recurrent neural networks; Semiconductor manufacturing process

Index Keywords

Bonding, Crushed stone plants, Deep neural networks, Investments, Long short-term memory, Profitability; Customer demands, Die bonding, Higher yield, Long short-term memory recurrent neural network, Manufacturing process, Neural networks, Semiconductor manufacturing industry, Semiconductor manufacturing process, Short term memory, Yield prediction; Predictive maintenance

References

- Terwiesch, C., Ren, Z., Ho, T., Cohen, M.A.
An Empirical analysis of forecast sharing in the semiconductor equipment supply chain
(2005) *Manage Sci*, 51 (2), pp. 208-220.
- Chen, T., Lin, Y.
A fuzzy-neural system incorporating unequally important expert opinions for semiconductor yield forecasting
(2008) *Int J Uncertain Fuzz Knowl-Based Syst*, 16 (1), pp. 35-58.
- Ahmadi, A.
Yield forecasting across semiconductor fabrication plants and design generations
(2017) *IEEE Trans Comput Aided Des Integr Circuits Syst*, 36 (120), pp. 2120-2133.
- Chen, T., Wang, Y.
An agent-based fuzzy collaborative intelligence approach for precise and accurate semiconductor yield forecasting
(2014) *IEEE Trans Fuzzy Syst*, 22 (1), pp. 201-211.
- Chen, T., Wang, Y.
Semiconductor yield forecasting using quadratic-programming-based fuzzy collaborative intelligence approach
(2013) *Math Probl Eng*, 2013 (102), pp. 1-7.

- Medsker, L., Jain, L.C.
Recurrent neural networks: Design and applications
(1999) *1st Edn*,
CRC Press, Boca Raton
- Gao, T., Chai, Y.
Improving stock closing price prediction using recurrent neural network and technical indicators
(2018) *Neural Comput*, 30 (10), pp. 2833-2854.
- Saikia, P., Baruah, R.D., Singh, S.K., Chaudhuri, P.K.
Artificial neural networks in the domain of reservoir characterization: A review from shallow to deep models
(2020) *Comput Geosci*, 135.
- Camila, C., Cardemil, J.M., Droguett, E.L., Behzad, M.
Assessment of deep learning techniques for Prognosis of solar thermal systems
(2020) *Renew Energy*, 15 (2020), pp. 2178-2191.
- Qing, X., Niu, Y.
Hourly day-ahead solar irradiance prediction using weather forecasts by LSTM
(2018) *Energy*, 148 (2018), pp. 461-468.
- Smagulova, K., James, A.P.
Overview of long short-term memory neural networks
(2020) *Model Optim Sci Technol*, 14, pp. 139-153.

Correspondence Address

Ibrahim A.M.; Department of Mechatronics Engineering, Selangor, Malaysia; email: azhar_ibrahim@iium.edu.my

Editors: Md. Zain Z., Sulaiman N., Mustafa M., Shakib M.N., A. Jabbar W.

Publisher: Springer Science and Business Media Deutschland GmbH

Conference name: 7th International Conference on Electrical, Control, and Computer Engineering, InECCE 2023

Conference date: 22 August 2023 through 22 August 2023

Conference code: 319219

ISSN: 18761100

ISBN: 9789819738502

Language of Original Document: English

Abbreviated Source Title: Lect. Notes Electr. Eng.
2-s2.0-85205088440

Document Type: Conference Paper

Publication Stage: Final

Source: Scopus

ELSEVIER

Copyright © 2024 Elsevier B.V. All rights reserved. Scopus® is a registered trademark of Elsevier B.V.

 RELX Group™