

Project title: Monocrystalline Intelligent Manufacturing

Abstract:

Driven by both the urgency of digital transformation and the rapid development of the photovoltaic industry, the digital transformation in photovoltaic industry is not only conducive to improving quality and efficiency with larger market share, but also serves the country and global industry more effectively. Working with Raipiot, this project serves to evaluate the potential of a semiconductor manufacturer, Yuze Semiconductor Co. Ltd., and the main common objective is to optimize production quality and efficiency.

Overcoming some pain points, poor data infrastructure for example, rod yield prediction and electrical performance prediction models are built, using functional principal component analysis and other machine learning models. During analyzing the results, some recommendations and insights are elicited for future improvement. The key takeaway for production is pull rate fluctuation could decrease crystallization rate. Also, the later a rod is produced, the worse electrical performance it has.

From the perspective of production, our analysis could somehow provide insights for our clients and help them optimize quality and efficiency during production process. In the future, to predict the ending mode or crystallization rate of a certain rod, a deep learning model is expected if adequate reconstruction work on dataset is accomplished.

Team composition:

Advisor: Shen Haipeng

Members: CAI Shida, CHEN Xinwei, HE Jiahong, LI Yibing, WANG Liting, ZHANG Zhenjie, ZHONG Xi, ZHOU Zipeng

Corporate partner introduction:

Our research project worked with a national high-tech enterprise Yunan Yuze and information technology company Raipiot. By 2024, Yunnan Yuze is expected to form 100-gigawatt production capacity with multi-site strategy under the digital transformation background.

項目名稱：單晶矽智能製造

摘要：

在數字化轉型和光伏產業快速發展的雙重驅動下，光伏產業的數字化轉型不僅有利於提高質量和效率，獲得更大的市場份額，還可以更有效地服務於整個產

業。本項目與 Raipiot 合作，為一家半導體製造商——宇澤半導體有限公司提供優化生產質量和效率的方案。

本項目克服了傳統行業數據基建差的痛點，利用功能主成分分析和其他機器學習模型，建立了晶棒產量預測模型和電性能預測模型。在分析結果的過程中，為未來的生產提出了一些建議。關鍵結論是：拉速的波動可能會降低結晶率，以及晶棒生產得越晚，它的電性能就越差。

從生產的角度來看，我們的分析可以幫助從數據的角度確定關鍵控制點，從而幫助廠商優化生產。在未來，如果對數據集進行了充分的重建工作，就可以使用深度學習模型來預測某個晶棒的收尾模式或成晶率。

團隊成員：

指導教師：沈海鵬

項目成員：蔡世達，陳心煒，何佳鴻，李藝冰，王立婷，張震傑，袁昕，周梓鵬

合作公司簡介：

本項目與國家高新技術企業雲南宇澤以及信息技術公司睿樸麟合作。到 2024 年，雲南宇澤有望通過數字化轉型，以及多站點戰略形成 100 吉瓦的生產能力。