



정밀 측정 및 박막 공정 연구실  
Metrology and Thin film process Lab.



## Prof. Pahk, Heui Jae

### ■ Career

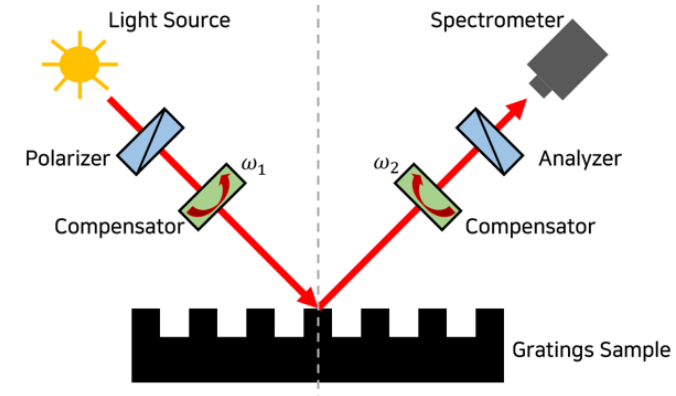
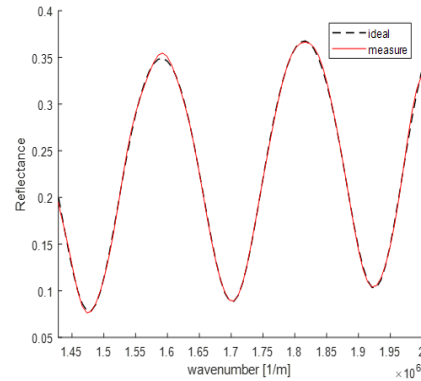
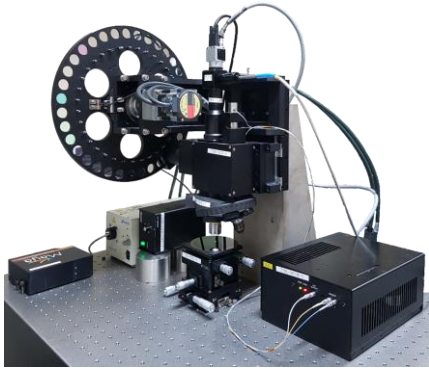
- 1979-1985 Seoul National University Mechanical Design Engineering B.S/M.S
- 1987-1991 Univ. of Manchester (UK) PhD, Research Associate
- 1991-1993 Assistant professor of Pohang University of science and technology
- 1998-2017 CEO of SNU Precision Co. Ltd.
- 2013-2017 Ministry of Trade, Industry and Energy R&D National CTO
- 1993-2020 Professor of Mechanical Engineering Department, Seoul National University
- 2004 대한민국 은탑 산업훈장(Order of Industrial Merit of Korea Silver Tower)
- 2004,2013 IR52 장영실 상(Jang Young Sil award)
- 2019 영국 맨체스터 대학교 기계공학과 공학원사  
(Higher Doctorate in Engineering, University of Manchester, UK)

### ■ Works

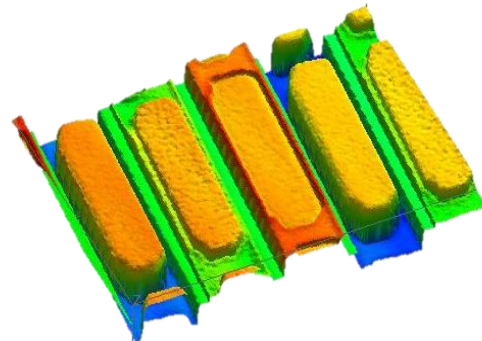
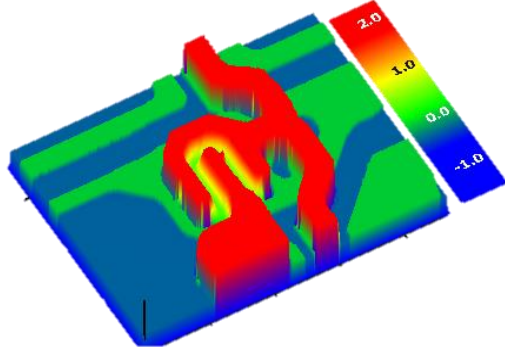
- 111 : Domestic / International Patent
- 65 : Journal Paper
- 130 : Conference Presentation

# Introduction

- **Research field:** Thin film optics, Ellipsometry, Interferometry, Reflectometry, Critical dimension, Optical inspection
- **Research purpose :** Quality and production process management
- **Target product :** LCD, OLED, Display panel, Semi conductor

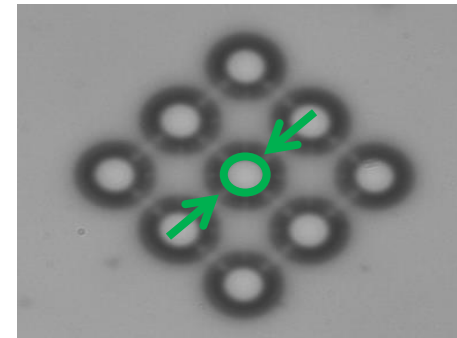


Reflectometry

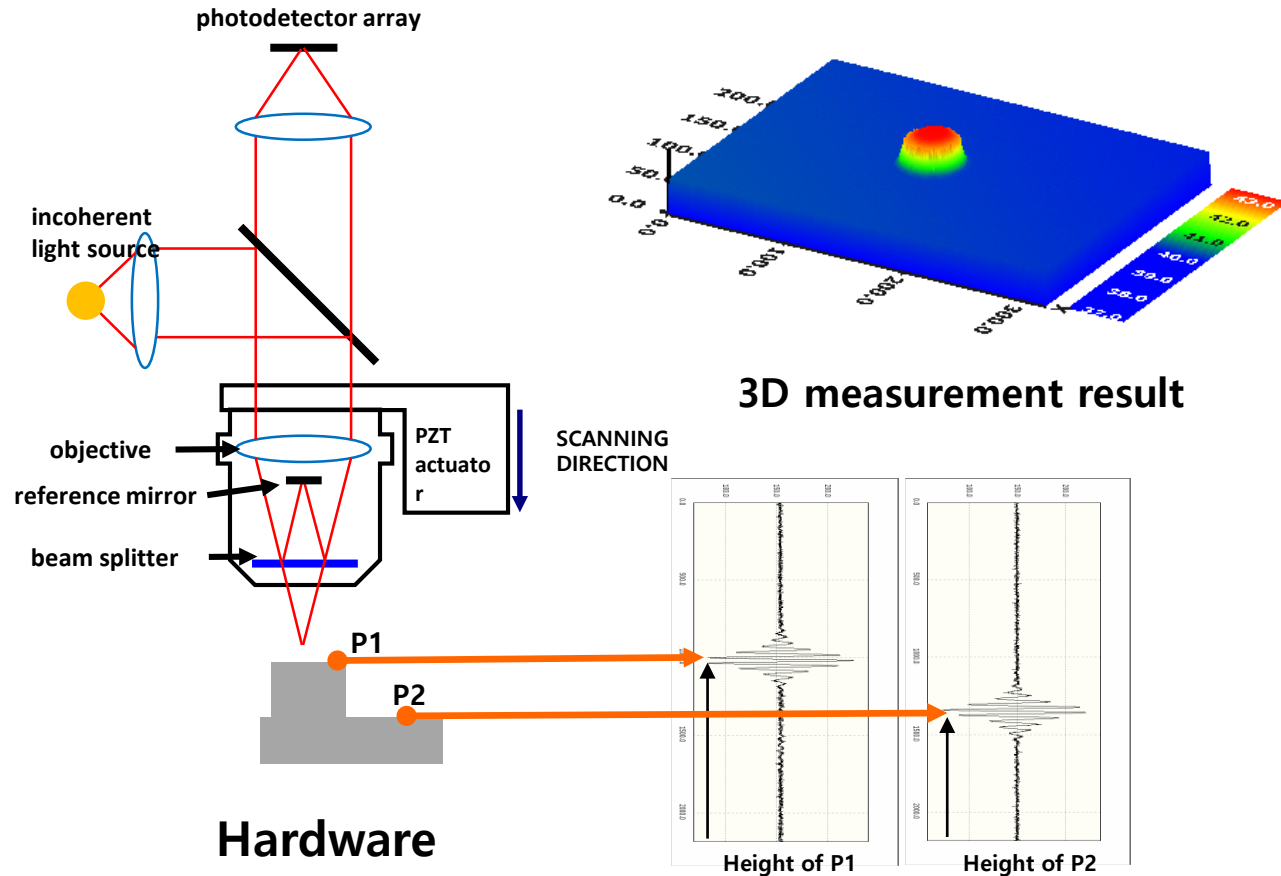


Interferometry

Ellipsometry



Critical dimension



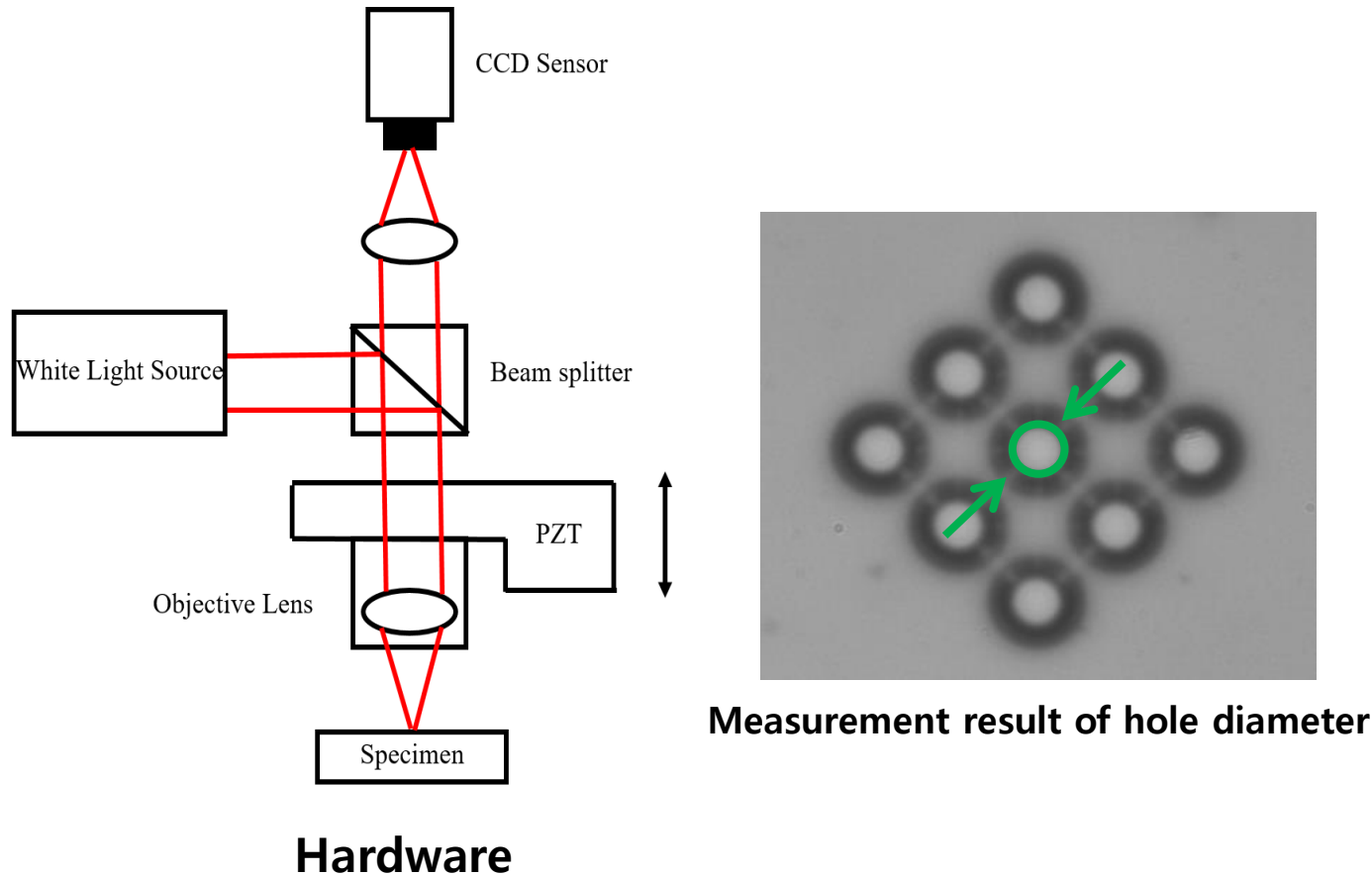
## Research Background

- Needs for fast & accurate 3D profile measurement in fine patterns
- $2\pi$  ambiguity in phase shift interferometry

## Achievement

- Height measurement repeatability ( $3\sigma$ ) < 10nm
- Solving  $2\pi$  ambiguity

# 2D Critical Dimension (CD) measurement using image processing

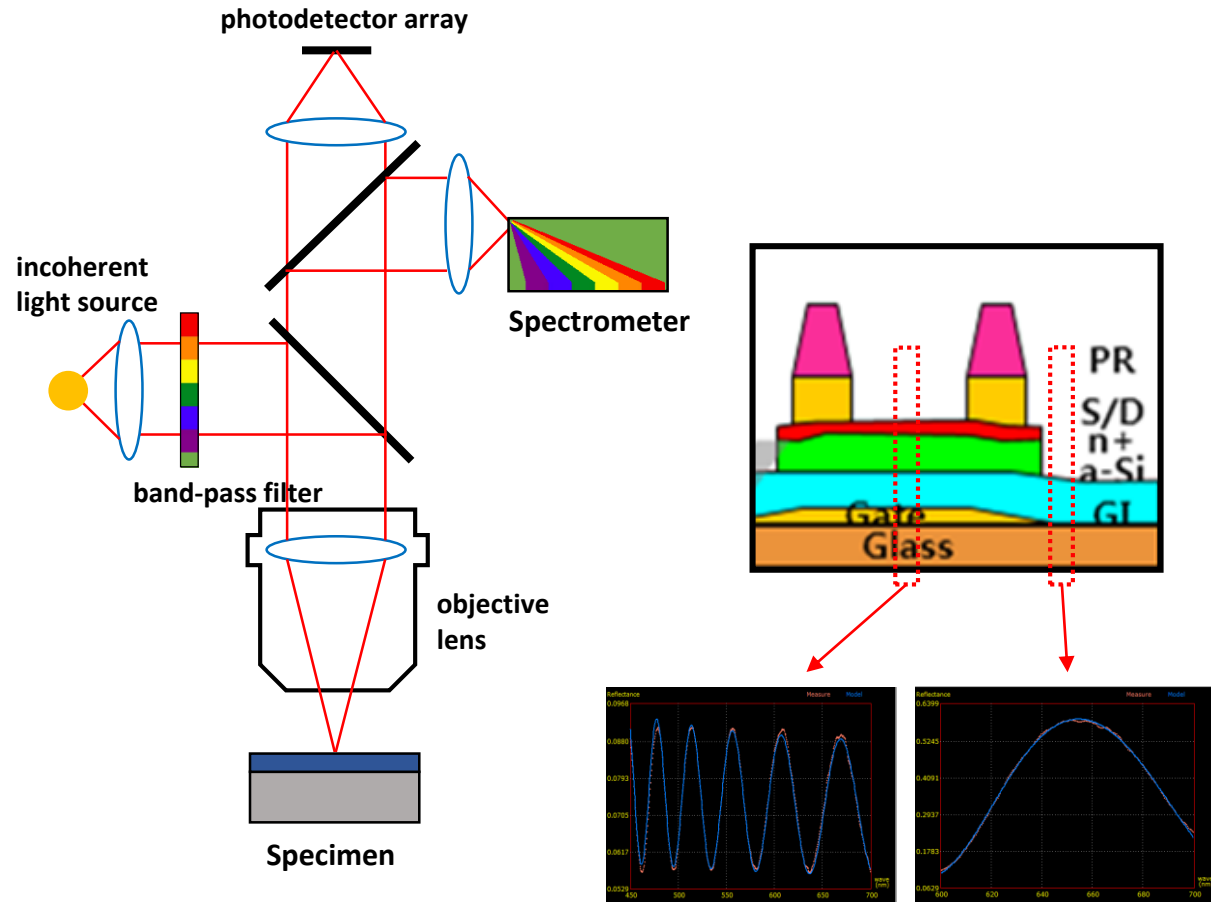


## Research background

- Automatic measurement of CD (line width, hole diameter) in micro patterns
- Accuracy improvement through the sub-pixel algorithm

## Achievement

- Measurement precision of 2D CD :  $3\sigma < 50\text{nm}$
- Improved measurement accuracy of 2D CD



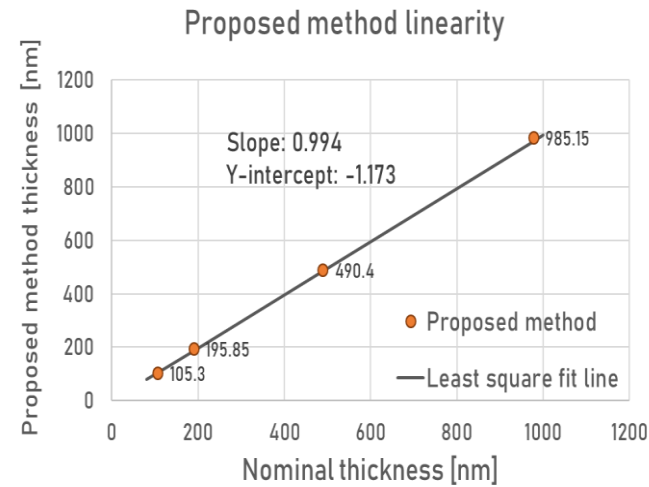
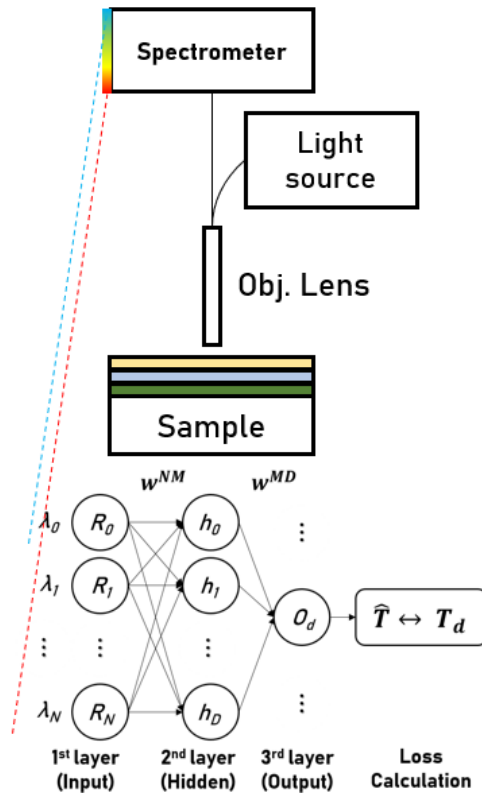
Hardware

## Research Background

- Needs for fast & accurate thickness measurement of thin film in fine patterns
- Spot type thickness measurements
- Imaging type thickness measurements

## Achievement

- Improved accuracy for thickness profile measurements
- Thickness measurement repeatability ( $3\sigma$ ) < 1Å



**Linearity test**  
Nominal - Measured

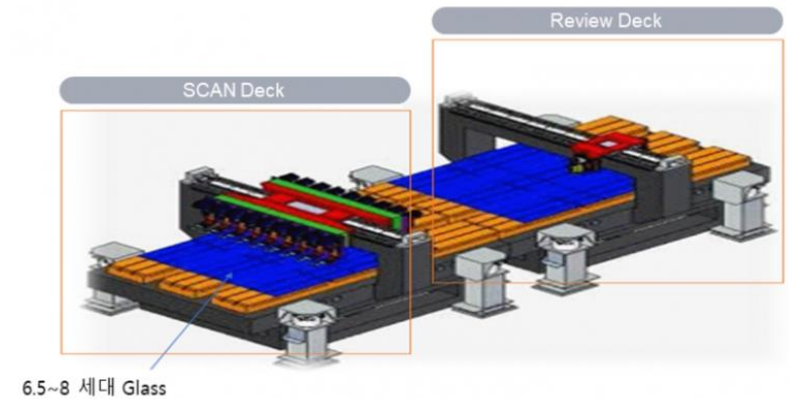
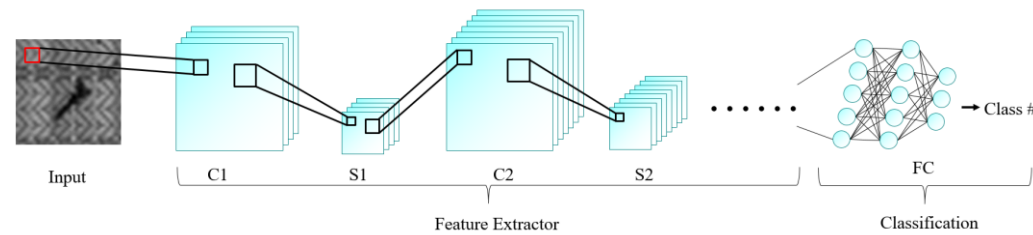
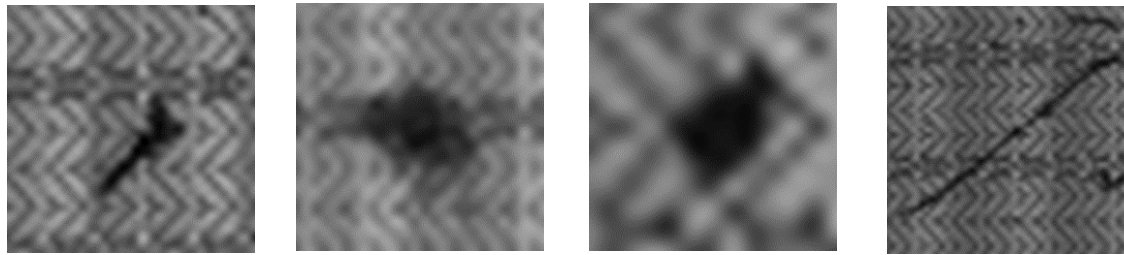
## Research Background

- Multi-Layer thickness determination local minimum
- Measurement speed problem
- Initial value problem & non-iterative solution requirement

## Achievement

- Real time measurement speed
- Efficient computation

# TFT-LCD Defect classification system using convolutional neural network



Hardware : AOI Defect inspection system

## Research Background

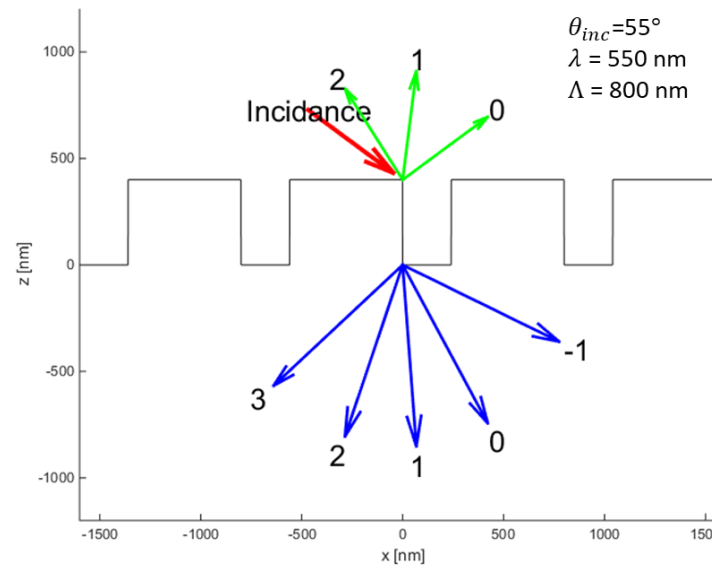
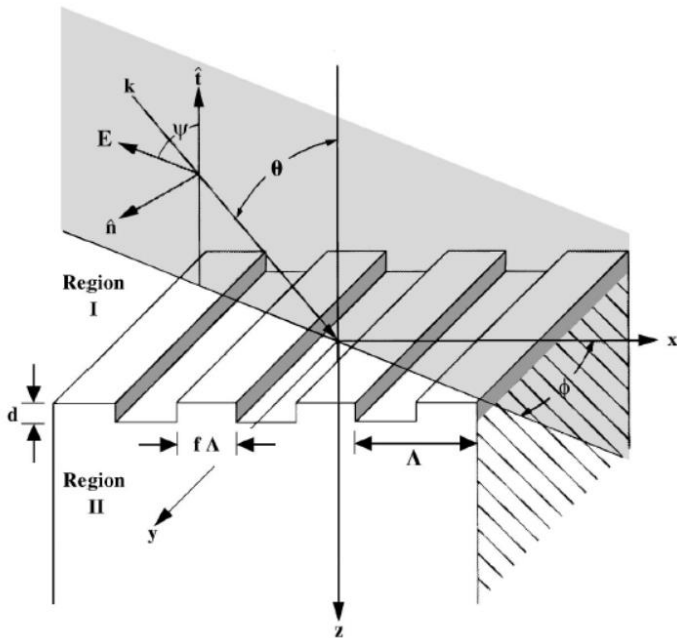
- Convolutional neural network & Machine learning based feature detection and classification
- Measurement speed problem

## Achievement

- High accuracy and real time defect detection & classification system development



# Measurement of grating structure below the diffraction limit using Optical Critical Dimension (OCD)



Light diffraction in grating structure

## Research background

- Analysis of light characteristics in grating structure using the diffraction and RCWA
- Improve the measurement sensitivity through parameter optimization

## Achievement

- Measurement of CD less than 100nm
- Development of high performance Ellipsometry



## Contact

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