UNIVERSITY OF HONG KONG

DOCTORAL THESIS

HKU Doctoral Thesis Template

Author:
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A thesis submitted in fulfillment of the requirements
for the degree of Doctor of Philosophy

in the

Department Name
Faculty Name

July 2, 2020

Abstract of thesis entitled

HKU Doctoral Thesis Template

Submitted by

FirstName FAMILYNAME

for the degree of Doctor of Philosophy

at The University of Hong Kong

in July, 2020

Put Your *Abstract* Here ...

This latex project is a doctoral thesis template for the University of Hong Kong. The style and design of the entire project closely follow the official guidelines from the Graduate School: **Preparing and Submitting Your Thesis — A Guide for MPhil and PhD Students.** Generally, there is no strict stipulations on the style or format of different components of the thesis, except for the **Abstract**. According to the detailed regulations [**Link**], the **Abstract** should be part of the thesis with no fewer than 200 and no more than 500 words. The format shall be the same as that of the thesis itself. The front page of each abstract shall contain the statement which includes:

- Abstract of thesis entitled "……"
- Submitted by ……
- for the degree of ……
- at the University of Hong Kong in (July 2, 2020).

In addition to the opening of abstract, the abstract should appear before the title page. The abstract in this template is not numbered, or counted in the pagination of the front matter, or listed in the table of contents. All the requirements are fulfilled in this template.

How to adjust the typeset of Abstract

The typeset of the opening of abstract page is defined in the class file HKUThesis.cls **Line 507-529**. Users can adjust the typeset by changing the settings. The layout of the main text is consistent with other parts of the thesis.

Note that: Considering the university may change its standards over time, users are not supposed to 100 percent "trust" this template. Even though the template is prepared strictly follow the stipulations of the Graduate School of The University of Hong Kong, this is **not an official** template and we are **not responsible** for any problems of your

thesis submission caused by the format, style, typeset, etc of the template. We **strongly suggest** the users to read the latest **Guidelines on Thesis Submission** carefully and adjust the template accordingly to satisfy the stipulations of the university.

HKU Doctoral Thesis Template

by

FirstName FAMILYNAME
B.S. *HKU* M.S. *HKU*

A Thesis Submitted in Partial Fulfilment
of the Requirements for the Degree of
Doctor of Philosophy

at

University of Hong Kong
July, 2020

Declaration

I, FirstName FAMILYNAME, declare that this thesis titled, "HKU Doctoral Thesis Template", which is submitted in fulfillment of the requirements for the Degree of Doctor of Philosophy, represents my own work except where due acknowledgement have been made. I further declared that it has not been previously included in a thesis, dissertation, or report submitted to this University or to any other institution for a degree, diploma or other qualifications.

Signed: *Author Name*

Date: July 2, 2020

For Mama and Papa

Acknowledgements

I would like to thank...

FirstName FAMILYNAME
University of Hong Kong
July 2, 2020

List of Publications

JOURNALS:

[1] **Nan Meng**, Hayden K.-H. So, Xing Sun, and Edmund Y. Lam, "High-dimensional dense residual convolutional neural network for light field reconstruction," *IEEE Transactions on Pattern Analysis and Machine Intelligence*, October 2019.

[2] **Nan Meng**, Zhou Ge, Tianjiao Zeng, and Edmund Y. Lam, "LightGAN: a deep generative model for light field reconstruction," *IEEE Access*, June 2020.

[3] **Nan Meng**, Xing Sun, Hayden K.-H. So, and Edmund Y. Lam, "Computational light field generation using deep nonparametric Bayesian learning," *IEEE Access*, vol. 7, pp. 24990–25000, February 2019.

[4] **Nan Meng**, Edmund Y. Lam, Kevin K.-M. Tsia and Hayden K.-H. So, "Large-scale multi-class image-based cell classification with deep learning," *IEEE Journal of Biomedical and Health Informatics*, vol. 23, no. 5, pp. 2091–2098, September 2019.

CONFERENCES:

[1] **Nan Meng**, Xiaofei Wu, Jianzhuang Liu, and Edmund Y. Lam, "High-order residual network for light field super-resolution," in *Association for the Advancement of Artificial Intelligence*, vol. 34, no.7, pp. 11757-11764, 2020.

[2] **Nan Meng**, Tianjiao Zeng, and Edmund Y. Lam, "Spatial and angular reconstruction of light field based on deep generative networks," in *IEEE International Conference on Image Processing*, pp. 4659–4663, September 2019.

[3] **Nan Meng**, Tianjiao Zeng, and Edmund Y. Lam, "Perceptual loss for light field reconstruction in high-dimensional convolutional neural networks," in *OSA Topical Meeting in Computational Optical Sensing and Imaging*, pp. CW1A.5, June 2019.

[4] Edmund Y. Lam, **Nan Meng**, and Hayden K.H. So, "Deep convolutional neural network for single-cell image analysis," in *High-Speed Biomedical Imaging and Spectroscopy: Toward Big Data Instrumentation and Management*, volume 10505 of Proceedings of the SPIE, pp. 105050K, January 2018.

[5] **Nan Meng**, Hayden K.-H. So, and Edmund Y. Lam, "Computational single-cell classification using deep learning on bright-field and phase images," in *IAPR Conference on Machine Vision Applications*, pp. 164–167, May 2017.

[6] Xing Sun, Zhimin Xu, **Nan Meng**, Edmund Y. Lam, and Hayden K.-H. So, "Data-driven light field depth estimation using deep convolutional neural networks," in *IEEE International Joint Conference on Neural Networks*, pp. 367–374, July 2016.

[7] Xing Sun, **Nan Meng**, Zhimin Xu, Edmund Y. Lam, and Hayden K.-H. So, "Sparse hierarchical nonparametric Bayesian learning for light field representation and denoising," in *IEEE International Joint Conference on Neural Networks*, pp. 3272–3279, July 2016.

PATENTS:

[1] **Nan Meng**, Xiaofei Wu, Jianzhuang Liu, "Image Enhancement and Reconstruction based on Camera Array", [*under review*]

DATASETS:

[1] **Nan Meng**, Edmund Lam, Tsia, Kevin Kin Man, So, Hayden Kwok-Hay, "Human somatic label-free bright-field cell images", IEEE Dataport, 2018. [Online]. Available: http://dx.doi.org/10.21227/H2QW97. Accessed: Mar. 13, 2019.

Contents

List of Figures

List of Tables

List of Algorithms

List of Abbreviations

ASAP	**A**s **S**oon **A**s **P**ossible
AKA	**A**lso **K**nown **A**s
BPFA	**B**eta **P**rocess **F**actor **A**nalysis
CNN	**C**onvolutional **N**eural **N**etwork
GAN	**G**enerative **A**dversarial **N**etwork
MSE	**M**ean **S**quare **E**rror
PSNR	**P**eak **S**ignal-to-**N**oise **R**atio
SSIM	**S**tructural **SIM**ilarity

List of Symbols

Global notations

I^{SR}	super-resolved light field image	—
I^{LR}	low-resolution light field image	—
I^{HR}	high-resolution light field image	—
E^{SR}	super-resolved epipolar plane image	—
E^{HR}	high-resolution epipolar plane image	—

Chapter 1

θ, ϕ	incoming direction expressed in term of spherical coordinates	rad
τ	time	s (second)
x,y	spatial coordinates with two-plane parameterization	1 (uint)
s,t	angular coordinates with two-plane parameterization	1 (uint)
P	radiance distribution	$\mathrm{W/srm^2Hz}$
Ω	image plane	—
Θ	parameters of the multi-layer framework	—
γ_s, γ_a	scaling factors of spatial / angular coordinates	1 (uint)
$\mathcal{L}$	loss function	—

Chapter 2

F_0	shallow features extracted by a single HConv layer	—
$F_{\mathrm{G_d}}$	feature maps extracted by the d^{th} HRB of the GRLNet	—
$H^{\mathrm{n}}_{\mathrm{HRB}}$	the operation of the n^{th} HRB of the SReNet	—
H_{AGBN}	the operation of the proposed aperture group batch normalization algorithm	—
H_{up}	upsampling operation on the low-resolution features	—
ℓ_A	angular loss	—
ℓ_S	spatial perceptual loss	—
ℓ_{SA}	the weighted combination of ℓ_A and ℓ_S	—

f	the summation of all the feature maps after every activation function of VGG network	—
g	learned mapping between the low-resolution and high-resolution light field images	—

Chapter 3

x,y	spatial coordinates with two-plane parameterization	1 (uint)
s,t	angular coordinates with two-plane parameterization	1 (uint)
γ_s, γ_a	scaling factors of spatial / angular coordinates	1 (uint)
ℓ_G	generator adversarial loss	—
ϕ	denotes the mapping of VGG network	—
δ	nearest neighbor downsampling operator	—
κ	a Gaussian blurring kernel with a window size of 7×7 and standard deviation of 1.2 pixels	—
η	additive noise with zero mean and unit standard deviation	—

Chapter 1

Introduction

1.1 General Information

This template is for MPhill/Doctor students of University of Hong Kong to prepare their theses. The entire project strictly follows the requirements of booklet provided by Graduate School of the University of Hong Kong. The current version of this template is prepared according to the **13th** edition of the booklet entitled "Preparing and Submitting Your Thesis — A Guide for MPhil and PhD Students." This edition is updated in **July 2019**. Considering the university may change the stipulations over time, this template also provides the guidelines to adjust the typeset. The current version of the template has been tested by the author(s) and has been successfully accepted by the Engineering Faculty. However, users should also notice that this is not an official template, and we are not responsible for any problems of your thesis preparation and submission caused by using this template. For anyone who would like to use this template, you have to be responsible for your thesis and your are supposed to carefully read and follow the rules in the latest edition of the university booklet to prepare your thesis. In the rest of the template, we will demonstrate how to use, change, or adjust this template.

1.2 General Requirements of Graduate School

According to the 13th edition booklet, "The Thesis Format" section, the thesis submitted for examination shall be typewritten or printed on one side or both sides of International size A4 paper, with a margin of not less than 35mm on both right and left-hand edges of each page (as shown in Fig. 1.1).

1.2.1 Page Margin

The format of page size and margin is defined in "main.tex" file **Line 63-71**. The page margin of the current version template is Left: 35mm, Right: 36mm (a4paper). Users

The Thesis Format

The University stipulates that:

> *The thesis submitted for examination shall be typewritten or printed on one side or both sides of International size A4 paper (except for drawings, maps or tables on which no restriction is placed), with a margin of not less than 35mm on both right and left-hand edges of each page.*
>
> *Regulations Governing the Format, Binding and Presentation of Theses for Higher Degrees by Research*

Figure 1.1: Requirements of the thesis format in the Graduate School 13th edition booklet at Page 9.

can change the page margin by adjusting the corresponding settings. There is no stipulation for the top and bottom margins, but the booklet recommend that both of them should be 25mm, which is adopted in this template.

1.2.2 Font, Alignment, Line Spacing

Ordinarily, there is no restrict stipulation for the font family, font size, alignment, and line spacing. All of these are a matter of personal preference. This template uses *10pt* font size, *Fully Justified* alignment style and *One and A Half* line spacing. Users can adjust the settings in **Line 19-33** of the "main.tex" file to change the typeset.

1.2.3 Contents

The contents of this template can be subdivided into three parts — the front matter, the text and the back matter, which strictly follows the stipulations of the official booklet (Page 17). Table 1.1 indicates the what contents are required in the submitted thesis and what contents are optional. The column "Required" denotes that

Table 1.1: Checking list indicating the contents should be included in the thesis.

The Front Matter	Required	Include ✓
Abstract	Yes	✓
Title Page	Yes	✓
Frontispiece		
Dedication		✓
Epigraph		
Declarations	Yes	✓
Acknowledgements		✓
Table of Contents	Yes	✓
List of Illustrations		

List of Figures		✓
List of Tables		✓
List of Algorithm		✓
List of Abbreviations		✓
List of Symbols		✓
Others		
The Text	Yes	✓
The Reference or Back Matter	—	—
Glossary		
Appendices		
Notes		
Bibliography or Reference List	Yes	✓
Index		

This template support most of the contents listed in the figure, including the "Abstract", "Title Page", "Declarations", "Acknowledgements", "List of Publications", "Contents", "List of Figures", "List of Tables", "List of Algorithms", "List of Abbreviations", "List of Symbols", "Main Text", "Appendices", and "Bibliography". Each part is defined in an independent tex file and the "main.tex" file combines all the different parts to form the entire thesis. Therefore, users can easily make the changes by adjusting the corresponding document files.

In addition to the stipulations of the booklet, this template also provides a beautiful **cover page**, which is the first two pages of this project. The cover page is **not required** by the Graduate School and you'd better remove the cover page when bounding your thesis for submission.

Chapter 2

Guidelines on Adjustments

This chapter demonstrates how to make changes and DIY the thesis style when using this template. For each component of the thesis, we provide both

2.1 Title Page

Title Page is designed to obviously bear the title of the thesis and the author's name. Users can add any degrees or professional qualifications that he/she holds as well as the author's name in the national script. Both the title and the author's name are highlighted in blod style. Given that there may also be an oral and/or written examination, and thus this template uses the following form of words:

> A thesis submitted in partial fulfilment of the requirements for the degree of Doctor (or Master) of Philosophy at The University of Hong Kong.

The title page is not numbered, or counted in the pagination of the front mater, or listed in the table of contents. The document for title page is quite simple, which can be found in the path `Titlepage/titlepage.tex`.

2.2 Dedication

Dedication is a place to show your wish to dedicate the thesis to friends, family or loved ones. This template uses a single page example for dedication, as shown in Fig. 2.1. This page is not numbered, or counted in the pagination of the front matter, or listed in the table of contents.

Figure 2.1: An example dedication page.

2.3 Epigraph

Epigraph is a relevant quotation on the subject of the thesis, or some general guidelines or philosophical principles. Ordinarily, the author and source of the quotation should also be given. This page is not included in the template and users can add the epigraph page according to their willingness.

2.4 Declarations

Declarations page is a required item according to the official booklet. The contents of declaration are in terms of the official sample (*Sample Page 6* on page 41 of the booklet) with some minor changes to specify the author's name and thesis title.

2.5 Acknowledgements

Acknowledgements is the place where the author thanks mentors, labmates, colleagues, friends, family members and also the financial support from scholarships and research grants. Each page of the acknowledgements is numbered in lower case Roman numerals

2.6 Table of Contents

Table of Contents in this template is simply headed "Contents" which lists all the parts of the thesis and the page on which they commence. Each of the chapters, sections and subsections are included in the list. The capitalization and wording of the titles listed in the table exactly agree with the corresponding ones appear in the body text. If users would like to include some optional pages in the Table of Contents, such as the Frontispiece page or Epigraph page, they can simply add a command `\addchaptertocentry{\pagename}` at the corresponding page. For example, your can add the *Abstract* item to the Table of Contents, by adding the command to the file Abstract/abstract.tex , as shown in Fig. 2.2.

```
1 \begin{abstract}
2 \addchaptertocentry{\abstractname} % Add the abstract to
  the table of contents
3 Put Your \emph{Abstract} Here ...
```

Figure 2.2: An example of how to add chapter to the Table of Contents.

2.7 List of Tables, Figures and Algorithms, etc

Following the Table of Contents, the template includes the lists of tables, figures and algorithms, abbreviations and symbols. The numbering, capitalisation and wording of

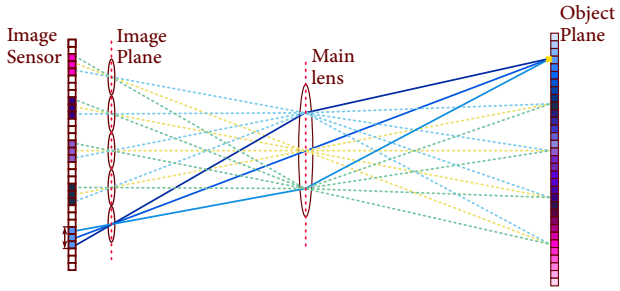

Figure 2.3: Light transformation model in a plenoptic camera. Within a plenoptic camera, a micro-lens array has been placed at the image plane, which further splits the incoming light rays from different directions and records them separately. Therefore, the multi-view information can be extracted from each light field image captured by a single shot.

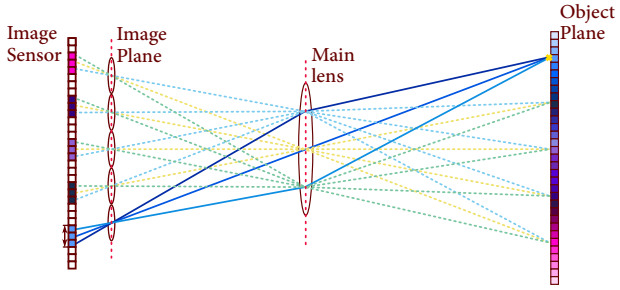

Figure 2.4: Light transformation model in a plenoptic camera. Within a plenoptic camera, a micro-lens array has been placed at the image plane, which further splits the incoming light rays from different directions and records them separately. Therefore, the multi-view information can be extracted from each light field image captured by a single shot.

the titles of every items listed agree exactly with the manner in which they appear in the body text. For the illustration with a long title, users can also provide a "nickname" of the illustration by enclosing the it in the square brackets. For example, Fig. 2.3 and Fig. 2.4 have the same image captions in the body text, but the wordings appear in the Table of Contents are different. Fig. 2.4 uses the wordings in the square brackets as its caption, as shown at page vii.

Appendix A

About Appendix

The appendix is usually used to provide some supplementary materials for the publications. For example, some experimental results, network architecture, detailed experimental settings or proving of the theories. You can have more than one appendices to provide the materials for different uses.

Appendix B

Appendix Title Here

Write your Appendix content here.

Appendix C

Appendix Title Here

Write your Appendix content here.