

Online Verification Report of Higher Education Qualification Certificate

Date of Renewal: Oct. 13, 2024 Date of Expiry: Oct. 12, 2025

Name ZHOU YING

Sex Female

Date of Birth Aug. 18, 1994



Start Date Sep. 01, 2016

Completion Date Jan. 07, 2020

Higher Education Institution Fudan University

Major Neurobiology

Length of Program 3 Years

Education Level Postgraduate (Master)

Type of Education Regular Higher Education

Form of Learning Full Time

Status Graduated

Certificate No. 1024 6120 2002 0012 03

President Name XU NINGSHENG



Online Verification Code A3V7WJMNK2YENUL3

① Online authentication of the report can be made at <https://www.chsi.com.cn/xlcx/en/>

② or scan the QR code by 学信网 App.

Notes:

- For more information about "Type of Education" and "Education Level", please visit <https://www.chsi.com.cn/en/service/note.jsp>.
- This verification report is based on the re-check result of the qualification certificate electronic registration information in accordance with the *Regulation of Higher Education Student Record and Qualification Registration (Jiaoxue [2014] 11)*. It should be CHSI (<https://www.chsi.com.cn>), the only MOE-designated qualification authentication website, that conducts online verification service.
- The report is subject to change. Please use the latest version of the report.
- The report shall not be used for other purposes without the consent of its owner.
- The online verification validity of the report is 1 year and can be extended before the report is expired by the report owner.



Fudan University Master's Degree Related Materials

This document serves as proof that I pursued and completed a Master's degree in Neurobiology at Fudan University from 2016 to 2020, including my thesis submission and successful defense. The document consists of three parts:

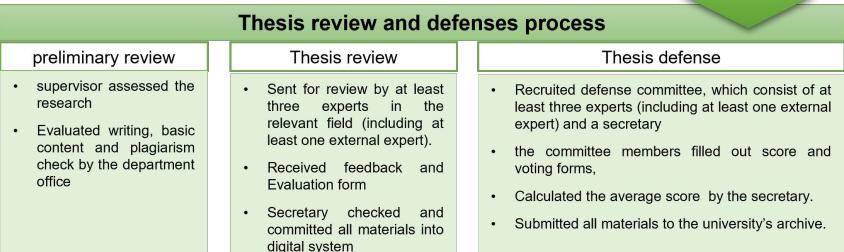
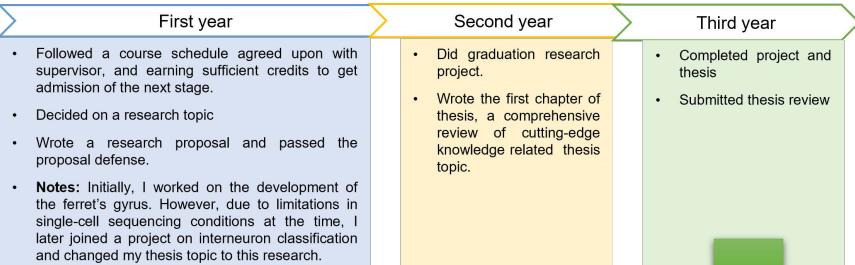
1. Online verification report of qualification certificate for Official Chinese Master's Degree

- The left side of this page can be verified through the Chinese official CHSI platform.
- Master's programs offer two certificates: **Qualification certificate**, which prove completion of all requirements in programs (compulsory credits, graduation thesis and pass thesis defense); and **Degree certificate**, published journal paper related Master's degree as first author (SCI >6.0 top three author). The detailed requirements show in page five of this file.

Please note, while I pass and got excellent evaluation in thesis, I only have the qualification certificate at this stage. Due to the pandemic, I graduated in 2020, and my journal paper was published in 2022. Unfortunately, the author ranking and impact factor of the paper did not meet the requirements for a Degree Certificate. Additionally, I published another journal paper as co-first author in 2022 while working at Xinhua Hospital, but the first affiliation did not meet the degree requirements either. I understand that not all Master's degrees have such strict criteria, so considering this special situation and for fairness in the application process, I sincerely request that evaluate my academic performance at the time in light of Fudan University Master's Degree Application Form (second part) and my graduation thesis (third part).

2. Fudan University Master's Degree Application Form

Since there are multiple forms of Master's training, this section briefly describes the training process and degree application requirements. The Master's Degree Application Form is provided as supporting evidence. My program was an Academic Master's in Neurobiology, and the training process and requirements were as follows:



Note: These materials are part of the training booklet and were completed in handwritten Chinese, keeping visible corrections to avoid any tampering. **For ease of reading, the left side of each page contains the original scanned document (with handwritten entries), while the right side contains the corresponding English translation in black text, with specific explanations in red text.**

3. English Translation of the Master's Thesis

The thesis for this program was written in Chinese, so I have translated it into English to support my Ph.D. application.

復旦大學

硕士 学位 申 请 书



Master's Degree Application Form

(Academic degree)

申请 人 姓 名: 周莹
学 号: 16211520021
专业(领域)名称: 神经生物学
指 导 教 师: 禹永春
所 属 院 系: 脑科学研究院

Applicant's Name: ZHOU YING
Student ID: 16211520021
Major (Field): Neurobiology
Supervisor: Prof. Yu Yongchun
Institute: Institute of Brain Science

二〇一九年十月二十八日

Oct. 28th, 2019

说 明

- 一、表内所列项目应实事求是认真填写。如不够填写，可另加附页。
- 二、表内项目一律使用黑色钢笔或水笔书写，字迹端正、清楚。
- 三、一律使用近期一寸正面免冠照片。
- 四、申请人用于申请学位的课程成绩、发表学术论文必须符合学位学术水平的基本要求。
- 五、本表和其它学位材料（如学位论文评阅书、学位论文答辩会议记录和决议书等）由院系送校档案馆存档。

Instructions

1. The items listed in the form must be filled out truthfully and carefully. If there is not enough space, additional pages can be attached.
2. All entries in the form must be written in black ink pen or ballpoint pen, with neat and clear handwriting.
3. A recent, one-inch, front-facing photo without a hat must be used.
4. The applicant's course grades and published academic papers used for the degree application must meet the basic requirements for the academic level of the degree.
5. This form, along with other degree materials (such as the degree thesis review form, degree thesis defense meeting records, and resolution, etc., will be submitted to the university archives by the department for record-keeping.

自我介绍 (一)

姓名	周莹			性别	女	出生日期	1994年8月18日	
籍贯	湖南省	民族	汉族	政治面貌	群众	学制	3年	
身份证件号码		360281199408182621						
硕士入学年月		2016年9月		入学前户口所在省(自治区、直辖市)		湖南省		
所学专业	神经生物学			指导教师	姓名	翁永春		
研究方向	脑神经环路发育				专业技术职务	研究员		
联系电话	19921875412			E-mail	452219604@qq.com			
主要学习、工作经历 (从高中开始)	起讫年月		单位名称			学生或职务		
	2009年9月至2012年6月		湖南省株洲市第二中学			学生		
	2012年9月至2016年6月		湖南农业大学			学生		
	2014年11月至2015年1月		中国科学院亚热带农业生态研究所			实习生		
	2016年9月至2019年1月		复旦大学			学生		
	年月至年月							
在学期间奖惩情况	获2016-2017学年 复旦大学光华奖学金 获2016-2017学年 复旦大学神经科学奖学金 获2017-2018学年 复旦大学神经科学奖学金 获2016-2017学年 复旦大学学业奖学金 获2017-2018学年 复旦大学学业奖学金 获2018-2019学年 复旦大学学业奖学金							
	入学前获最高学历		大学本科生		入学前获最高学位		学士学位	
	2016年6月15日 毕业(肄业)于		湖南农业大学		(院校)			
	专业, 获		工学		学士学位。			
	年月日 毕业(肄业)于				(院校)			
	专业, 获				硕士学位。			
入学前获学位情况	年月日 毕业(肄业)于				(院校)			
	专业, 获				博士学位。			

SSelf-Introduction (I)

Name	ZHOU YING			Sex	Female	Birth	18th Aug. 1994	
Place of Origin	Hunan	Ethnicity	Han	Political affiliation	None	Duration	3 year	
ID Number		360281199408182621						
Master's Enrollment Date		Sep., 2016			Province of Household Registration Before Enrollment			Hunan Province
Major	Neurobiology						Name	
Research Direction	Brain neural circuit development						Title	Investigator
Phone	19921875412						E-mail	452219604@qq.com
Main study and work experience (starting from high school)	Start and end dates			Institution Names				Student or Titles
	Sep. 2009 to jun. 2012			No. 2 High School, Zhu Zhou, Hunan Province				Student
	Sep. 2012 to Jun. 2016			Hunan Agricultural University				Student
	Nov. 2014 to Jan. 2015			Institute of Subtropical Agriculture Chinese Academy of Sciences				Intern
	Sep. 2016 to Jan. 2020			Fudan University				Student
Awards and disciplinary actions during the study period	Awarded the Fudan University Kuang-hua Scholarship for the academic year 2016-2017 Awarded the Fudan University Neuroscience Scholarship for the academic year 2016-2017 Awarded the Fudan University Neuroscience Scholarship for the academic year 2017-2018 Awarded the Fudan University Academic Scholarship for the academic year 2016-2017 Awarded the Fudan University Academic Scholarship for the academic year 2017-2018 Awarded the Fudan University Academic Scholarship for the academic year 2018-2019							
	Highest academic qualification before enrollment		Undergraduated		Highest degree awarded before enrollment		Bachelor's degree	
	Graduated on June 15th, 2016, from the Bioengineering program at Hunan Agricultural University, receiving a Bachelor of Engineering degree.							
Degree status before enrollment								

在学期间科研成果一览表

发表学术论文情况							备注 已发表 已录用 用
说明: 1. 填写以第一作者*发表、且第一署名单位为复旦大学的学术论文; 2. 按下列格式填写: 作者, 论文题目, 期刊名称, 期刊类型 (SCI 杂志须注明影响因子), 出版年份, 卷号(期号), 起止页码; 3. 中英文期刊名称均须写全称。							
1							
2							
3							
4							
发表论文总数		1. 被 SCI 收录数		2. 被 SCIE 收录数		3. 被 EI 收录数	
4. 被 SSCI 收录数		5. 被 A&HCI 收录数		6. 被 CSSCI 收录数		7. 被 CSCD 收录数	
获奖及专利情况 (获奖或专利名称、级别、申请人排名):							
学位申请人填写的在学期间科研成果情况属实, 同意将以上科研成果用于申请硕士学位。							
导师审核签字:				年 月 日			
已查验科研成果证明材料的原件, 申请人在学期间的科研成果满足院系对申请硕士学位的相关要求。							
院系秘书审核签字:				年 月 日			

*可包括以下特殊情况:

- (1) 以姓氏笔画排名的期刊, 导师证明学位申请人是第一执笔人;
- (2) 申请人为第二作者、且第一作者为学位申请人的导师;
- (3) SCI 期刊的影响因子大于 6.0 且学位申请人排名在前三名。

List of Research Achievements During Study Period

Number	Published academic papers				Notes Published Accepted
	Instructions: 1. List academic papers published as the first author, with Fudan University as the first affiliated institution. 2. Follow the format below: Author, paper title, journal name, journal type (if it's an SCI journal, indicate the impact factor), year of publication, volume number (issue number), and page range. 3. The names of both Chinese and English journals must be written in full.				
1					
2					
3					
4					
Total number of published papers	1. Number indexed by SCI	2. Number indexed by SCIE	3. Number indexed by EI		
4. Number indexed by SSCI	5. Number indexed by A&HCI	6. Number indexed by CSSCI	7. Number indexed by CSCD		
Awards and patents (name of the award or patent, level, applicant ranking):					
The research achievements during the study period filled out by the degree applicant are factual, and they agree to use the above research achievements for the master's degree application.					
Supervisor's review signature:				Date:	
The original proof of research achievements has been verified, and the research achievements of the applicant during the study period meet the relevant requirements of the department for applying for a master's degree.					
Department secretary's review signature:				Date:	

* The following special situations may be included:

- (1) Journals ranked by the number of strokes of the surname, with the supervisor certifying that the degree applicant is the first author;
- (2) The applicant is the second author, and the first author is the applicant's supervisor;
- (3) The impact factor of SCI journals is greater than 6.0, and the degree applicant ranks within the top three.

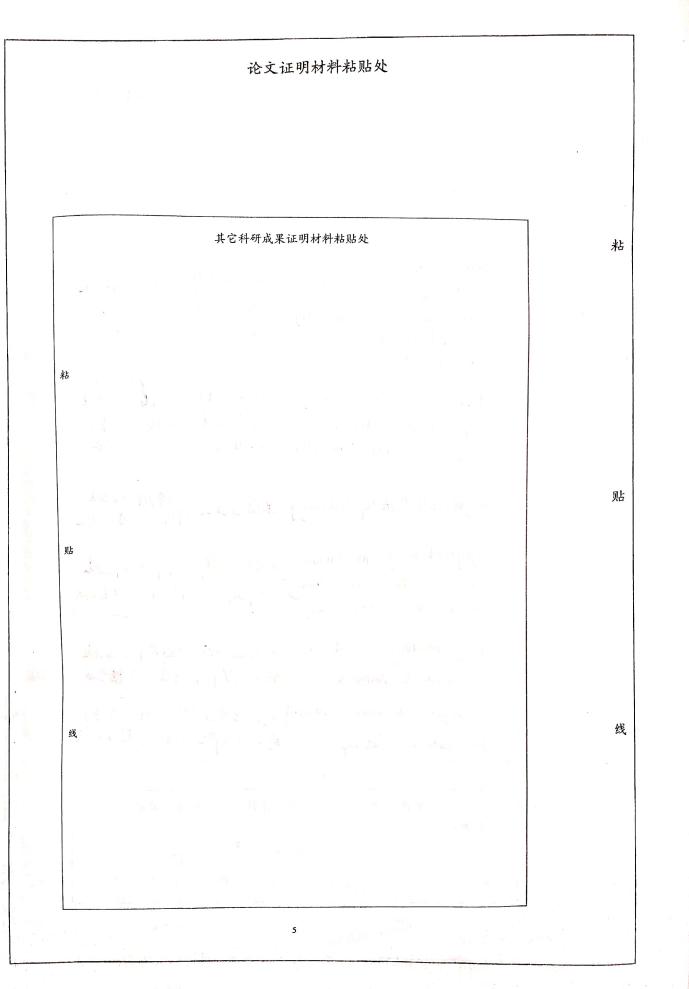
粘

贴

线

论文证明材料粘贴处

(注: 粘贴重点的1~2篇文章, 粘贴内容依次为期刊封面、目录页和文章首页。



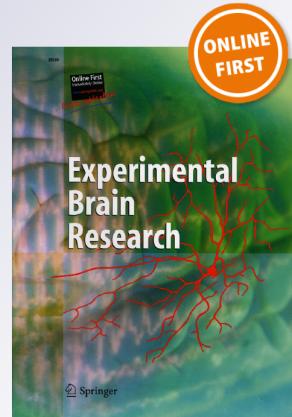
3

4

Effect of post-weaning isolation on anxiety-and depressive-like behaviors of C57BL/6J mice

Qian Huang, Ying Zhou & Lin-Yun Liu

Experimental Brain Research
ISSN 0014-4819
Exp Brain Res
DOI 10.1007/s00221-017-5021-5



Springer



Sncg, Mybpc1, and Parm1 Classify subpopulations of VIP-expressing interneurons in layers 2/3 of the somatosensory cortex

Shao-Na Jiang¹, Jun-Wei Cao¹, Lin-Yun Liu¹, Ying Zhou¹, Guang-Yao Shan², Ying-Hui Fu¹, Yun-Chao Shao^{3,*}, Yong-Chun Yu^{1,*}

¹Jing'an District Central Hospital of Shanghai, State Key Laboratory of Medical Neurobiology, MOE Frontiers Center for Brain Science, Institutes of Brain Science, Fudan University, Dong'an Road 131, Shanghai 200032, China,

²School of Clinical Medicine, Fudan University, Dong'an Road 131, Shanghai 200032, China,

³Orthopaedic Department of Zhongshan Hospital, Fudan University, Fenglin Road 180, Shanghai 200032, China

*Corresponding author: Email: sycjnt70@163.com or Email: ycyu@fudan.edu.cn

Neocortical vasoactive intestinal polypeptide-expressing (VIP⁺) interneurons display highly diverse morpho-electrophysiological and molecular properties. To begin to understand the function of VIP⁺ interneurons in cortical circuits, they must be clearly and comprehensively classified into distinct subpopulations based on specific molecular markers. Here, we utilized patch-clamp RT-PCR (Patch-PCR) to simultaneously obtain the morpho-electric properties and mRNA profiles of 155 VIP⁺ interneurons in layers 2 and 3 (L2/3) of the mouse somatosensory cortex. Using an unsupervised clustering method, we identified 3 electrophysiological types (E-types) and 2 morphological types (M-types) of VIP⁺ interneurons. Joint clustering based on the combined electrophysiological and morphological features resulted in 3 morpho-electric types (ME-types). More importantly, we found these 3 ME-types expressed distinct marker genes: ~94% of Sncg⁺ cells were ME-type 1, 100% of Mybpc1⁺ cells were ME-type 2, and ~78% of Parm1⁺ were ME-type 3. By clarifying the properties of subpopulations of cortical L2/3 VIP⁺ interneurons, this study establishes a basis for future investigations aiming to elucidate their physiological roles.

Key words: layer 2/3; somatosensory cortex; transcriptomic signatures; VIP-positive interneurons

Previous page require listing papers published as the first authour ,with Fudan University as the first affiliated institution. Only impact factor of SCI journals >6.0 and the degree applicant ranks within the top three can be listed.

During this stage, I only published a paper as second author (left figure) in 2017, but this paper not relavant with my thesis, I only assisted Animal Behavior plateform teacher did some simple experiments. Additionally, my thesis related paper published in 2022 (below figure), and I was only ranked as fourth author, which had not met requirement.

Therefore, this two paper could not wrote in this file, and I had not got Degree Certificate.

This page shows 3-5 scan pages of Application form, used to paste published paper as evidence.

Cerebral Cortex, 2022, 1–12

<https://doi.org/10.1093/cercor/bhac343>
Original Article

在学期间作科学报告或知识讲座情况	题目	主办单位	时间	地点
	Neurogenic Radial Glia-like Cells in Meninges Migrate and Differentiate into Functionally Integrated Neurons in the Neonatal Cortex	复旦大学脑科学研究院课题组	2017年3月28日	明道楼13楼会议室
	Llgl Connects Cell Polarity with Cell-Cell Adhesion in embryonic neural stem cells	复旦大学脑科学研究院课题组	2017年6月27日	明道楼13楼会议室
	Single-cell RNA-seq technology	课题组	2017年9月19日	明道楼13楼会议室
	Cyrisification of the cerebral cortex requires FGF signaling in the mammalian brain	复旦大学脑科学研究院	2017年12月12日	明道楼13楼会议室
	Young neurons in old brains from mice to humans	复旦大学脑科学研究院	2018年5月28日	治道楼8楼会议室
	Challenges and Novel Treatment for Diabetic Retinopathy	复旦大学脑科学研究院	2018年1月8日	治道楼8楼会议室

指导教师意见

学位申请人所填写的在学期间作科学报告或知识讲座情况属实。

指导教师(签名):

2019年12月11日

	Titles	Institutes	Date	Location
	Neurogenic radial glia-like cells in Meninges migrate and differentiate into functionally integrated neurons in the neonatal cortex.	Fudan University Institute of Brain Science research group meetings	Mar. 28th, 2017	Meeting Room 13, Mindao Building
	Llgl Connects Cell Polarity with Cell-Cell Adhesion in Embryonic Neural Stem Cells.	Fudan University Institute of Brain Science research group meetings	Jun. 27th, 2017	Meeting Room 13, Mindao Building
	Single-cell RNA-seq technology	Research group meetings	Sep. 19th, 2017	Meeting Room 13, Mindao Building
	Gyrification of the cerebral cortex requires FGF signaling in the mammalian brain	Fudan University Institute of Brain Science	Dec. 12th, 2017	Meeting Room 13, Mindao Building
	Young neurons in old brains: from mice to humans	Fudan University Institute of Brain Science	May 28th, 2018	Meeting Room 8, Zhidao Building
	Challenges and Novel treatment for diabetic Retinopathy	Fudan University Institute of Brain Science	Jan. 8th, 2018	Meeting Room 8, Zhidao Building

The information provided by the degree applicant regarding the scientific reports or knowledge lectures given during their study period is true.

Supervisor (Signature):
Yu Yongchun

2019年12月11日 Dec. 11th, 2019

自我介绍 (二)

学位论文题目:		开题时间	2017年10月
应用Ward层次聚类和迭代PCA分析皮层中间神经元电生理类型		完成时间	2019年9月
论文主题词	中间神经元, 大脑皮层, 中间神经元, 电生理	理论文字数	三万四十
论文类型	基础研究	选题来源	国家自然科学基金项目

一、选题意义

本研究希望通过对中国神经元的电生理数据进行量化，使用聚类方法尝试对中间神经元电生理进行分类，构建中间神经元电生理量化分类体系，避免人为分类的干扰，用于未来中间神经元研究整合电生理、形态学和分子等多种分类数据。

二、本课题前人的主要研究成果（简要说明）

传统的定性命名分类方式在一定程度上能够统一命名，但存在人为因素干扰，不同实验室获得的数据集之间难以比较，不利于实验的可重复性，分子电生理和形态等表型关系难以通过泛化分类进行整合。

2019年Allen Brain发表标准化电生理形态数据集，并提供较好的数据共享接口。出现了将形态、电生理、分子三个层面信息在同一神经元上采集的方法——Patch-seq，但通量非常低。电生理量化研究没有在大数据集上进行研究，但有用一些基础参数用Ward方法和k-means在小规模数据集上进行简单聚类。

三、论文工作中曾得到导师、其他教师和协作者哪些指导或帮助？

禹永春老师，对课题进行审指。

姜少娜师姐，共同讨论课题，指导电生理知识。

傅颖慧老师，对论文进行了修改检查。

注：1. 论文类型：包括基础研究、应用研究、开发研究、其它，选择其中一项。

2. 选题来源：包括国家计委（科委）项目、国家经贸委项目、国家自然科学基金项目、国务院其它部门项目、主管部门（部委级）项目、省（市、自治区）项目、学校级项目、国际合作项目、自选项目、其它项目，选择其中一项。

Self-Introduction (II)

Thesis Title: Classification of Electrophysiological Types of Cortical Interneurons Using Ward's Hierarchical Clustering and Iterative PCA Clustering		Start Date Oct. 2017
Completion Date Sep. 2019		
Keywords Interneuron, Cortex, Interneuron classification, electrophysiological feature	Word Count 34,000	
Type Basic Research	Source National Natural Science Foundation Project	

1. Significance of the Topic

This research aims to quantify the electrophysiological data of interneurons and attempt to classify them using clustering methods. The goal is to establish an electrophysiological classification system for interneurons, avoiding subjective interference in classification. This system could be used in the future to integrate multiple classification data on interneurons, including electrophysiology, morphology, and molecular information.

2. The achievement of previous studies in this field (Brief Description)

Although traditional qualitative classification methods have unified naming conventions to some extent, they are subject to human bias. Data sets from different laboratories are difficult to compare, which hinders the reproducibility of experiments. Moreover, the relationship between molecular, electrophysiological, and morphological phenotypes is difficult to integrate through qualitative classification.

In 2019, the Allen Brain Institute published a standard electrophysiological and morphological dataset and provided a good data-sharing interface. A method known as patch-seq emerged, which allows for the simultaneous collection of morphological, electrophysiological, and molecular information on the same neuron, but it has very low throughput. While quantitative electrophysiological research has not been conducted on large datasets, simple clustering using parameters like Ward's and k-means has been performed on small-scale datasets.

3. What guidance or assistance did you receive from your supervisor, other teachers, or collaborators during the course of your thesis work?

I received guidance on the project from my supervisor Prof. Yu yongchun; I discussed the topic together with Dr. Jiang shaona, and gained knowledge on electrophysiology from her; Prof. Fu Yinghui had revised and checked my thesis.

Note:

1. Type of Thesis: Includes basic research, applied research, developmental research, or other; select one.
2. Source of the topic: This includes projects from the National Planning Commission (Science and Technology Commission), the State Economic and Trade Commission, the National Natural Science Foundation of China, projects from other State Council departments, ministry-level projects, provincial (municipal, autonomous region) projects, university-level projects, international cooperation projects, self-selected projects, or other projects. Please choose one from these options.

四、论文有何新方法、新内容或新见解？意义何在？

- 对中间神经元的电生理数据进行量化，提取了30个电生理参数，构建中间神经元电生理量化分类体系，避免了人为分类的主观性干扰，用于将来中间神经元研究中整合电生理、形态和分子特性等多种分类数据，使得不同实验室的数据能够对比整合。
- 分析了569个不同分子类型的中间神经元电生理数据，并将不同电生理类型同分子类型和层分布信息进行了比较分析，不同分子类型的中间神经元在该数据集上没有明显偏好性。
- 使用Ward分級聚类和迭代主成分分析的方法对电生理特征聚类，分别得到了7个和8个子类，并对两种方法的结果进行了比较，Ward分級聚类易受到离群点的影响，迭代主成分分析对大数据集的聚类效果比Ward分級聚类要好，同时能够更灵活展示分析过程中各类型层次关系。

五、哪些问题有待继续探索？

- 仅用了无监督的分类方法，没有同人为主的分类结果进行比较，进一步研究可以人为对数据集分类构建监督分类模型，并将无监督分类结果也作为训练集构建分类模型，对分类模型进行优化。
- 虽然通过迭代方式进行了多次PCA计算，改变不同子类的参数权重，对于电生理的数据集能够较好的分类，但对推广到整体形态，电生理和分子数据集还有一段距离，需要向不同层次的数据模型选择进行优化。
- 中间神经元分类数据主要为电生理、分子和形态三方面；该研究目前仅探索了电生理量化分析，而对于中间神经元分类，需要综合不同层面信息，进一步应对形态学进行量化分析，以整合多层面数据的关联信息。

学位申请人（签名）：

周莹

2019年12月4日

**4. What new methods, content, or insights does the paper present?
What is the significance?**

- I quantified the electrophysiological data of interneurons and extracted 30 electrophysiological parameters, establishing an electrophysiological classification system for interneurons. This approach avoids the subjectivity of manual classification, and it can be used in future studies to integrate electrophysiological, morphological, and molecular classification data, enabling different laboratories to compare and integrate their findings.
- I analyzed the electrophysiological data of 569 interneurons of different molecular types and compared their electrophysiological characteristics with molecular types and layer distribution information. In this dataset, interneurons of different molecular types did not show obvious preferences.
- I used Ward's hierarchical clustering and iterative PCA)to cluster electrophysiological characteristics, resulting in 7 and 8 subtypes, respectively, and compared the results of the two methods. Ward's hierarchical clustering is susceptible to outliers, while iterative PCA performs better in clustering large datasets and can more flexibly demonstrate the hierarchical relationships among various types during the analysis.

5..What issues remain to be further explored?

- Only unsupervised methods were used, and no comparison was made with the results of qualitative classification based on human judgment. Further research can involve constructing supervised classification models for the dataset and using the unsupervised classification results as a training set to build the model, optimizing and comparing the models.
- Although multiple PCA calculations were performed iteratively, adjusting the parameter weights of different subtypes, this method worked well for classifying electrophysiological datasets. However, there is still a gap in extending this to integrate morphological, electrophysiological, and molecular datasets. Optimization is needed to select parameters that bind at different hierarchical levels.
- The classification of interneurons primarily relies on three aspects: electrophysiology, molecular characteristics, and morphology. This study only explored quantitative electrophysiological analysis. However, to achieve comprehensive interneuron classification, further research should involve the quantitative analysis of morphology to integrate information across different levels.

Degree Applicant (signature):

周莹

ZHOU YING

Dec. 4th, 2019

自我介绍 (三)

(本页适用于专业学位)

通过硕士阶段的训练，在专业知识、实践技能、解决实际问题能力等方面有何提高？(限1000字内)

本人在硕士阶段学习过程中，积极承担课题任务，积极思考问题，解决问题。积极阅读课题相关的各种文献，了解专业领域的前沿动态，通过实验加以实践，探索。

在专业知识和实践技能方面，研一和研二两年参与雪貂沟回发育机制研究课题，主要研究不同种类干细胞周期在沟回发育中的作用机制，主要进行的工作为，进行干细胞种类(RG, oRG, IP)的区分并结合 BrdU 累积曲线绘制，测定不同类型的干细胞平均细胞周期，为后续实验建立方法。在这一阶段的学习中学会了围绕研究问题查阅文献资料，将大的问题分解成小的具体问题解决，学习了层皮发育，沟回发育，神经干细胞增殖，分化，迁移等相关专业背景知识。学会了免疫组织化学，胚胎病毒注射，Western-blotting, RNA提取，PCR，脑片培养等实验技术，并初步尝试皮层沟回重构及一些统计方法。

研二开始由于雪貂沟回发育课题希望应用单细胞测序技术，学习了解了单细胞测序技术及组学测序数据挖掘分析相关知识，并和林敬宁师姐一起对雪貂皮层干细胞进行显微切割，制备干细胞样本，及流式细胞分选。同时为了学习测序数据分析参加诺基亚和致源2018年春季信息培训班，并在诺基亚实习一个月，学习了转录组分析相关技术。

通过实践发现自己对数据分析有浓厚兴趣，努力自学相关数据分析知识及所需编程技术，认真钻研，并根据实验室研究需求，将其应用于实际。中间神经元分类问题。从研二开始加入姜少娜师姐和曹军伟师兄的中间神经元分类课题，构建了电生理提取分类系统。

经过硕士阶段训练，对于专业领域的知识有了深入了解，拓宽了视野，投入大量时间进行深入思考，培养了独立思考，独立解决问题的能力。为日后的科学研究所奠定了坚实的基础。

Self-Introduction (III)

(This section also applies to professional degrees)

Through the training in the Master's program, how have you improved in terms of professional knowledge, practical skills, and the ability to solve real-world problems? (No more than 1000 characters)

During my master's studies, I actively took on research tasks, engaged in problem-solving, and thoroughly read various literature related to my project to stay informed of the latest advancements in my field. I combined this knowledge with experimental exploration.

In terms of professional knowledge and practical skills, during my first and second years of study, I participated in a research project focused on the mechanism of ferret gyrus development, specifically investigating the role of different types of stem cell cycles in this process. My primary work involved distinguishing between types of stem cells (RG, oRG, IP), plotting BrdU accumulation curves, and measuring the average cell cycle duration of different stem cell types, thereby establishing methods for subsequent experiments. Through this learning process, I gained knowledge in cortical development, gyrus development, and neural stem cell proliferation, differentiation, and migration. I also mastered various experimental techniques, including immunohistochemistry, embryonic virus injection, Western-blotting, RNA extraction, PCR, and brain slice culture, and made initial attempts at gyrus reconstruction and some statistical methods.

Starting in my second year, since the project aimed to apply single-cell sequencing technology, I studied the relevant knowledge of single-cell sequencing and multi-omics data analysis. Along with Dr. Lin Youning, we performed microdissection of ferret cortex, prepared discrete stem cell samples, and carried out flow cytometry sorting. To enhance my understanding of sequencing data analysis, I participated in Novo Gene's 2018 Spring Bioinformatics Training and interned at Novo Gene for a month, where I learned techniques related to transcriptome analysis.

Through practical experience, I discovered a strong interest in data analysis, which motivated me to learn more about data processing and the necessary programming skills. I applied these to a project on interneuron classification, where I worked with Dr. Jiang Shaona and Cao Junwei to build an electrophysiology data extraction and classification system.

The master's training gave me a solid understanding of the professional field, broadened my horizons, and fostered my ability to think critically and solve problems independently. It laid a strong foundation for my future scientific research.

有关专业技能考核或成果证明材料粘贴处

In mainland China, Master's degrees are divided into two types: **Academic Master's Programs**, which focus on academic research, emphasizing theory and the cultivation of research-oriented talents; and **Professional Master's Programs**, which are practice-oriented, emphasizing techniques learning.

My prgram is a Academic Master's Program, need not fill this page, which for Professional applicants.

一、请简要给出对申请人学位论文的评阅意见

该硕士学位论文利用Ward层次聚类和迭代PCA聚类分析的算法对大脑皮层中间神经元放电类型进行了系统地分析。研究结果表明，相较于Ward聚类算法，迭代PCA聚类分析更适用于中间神经元放电类型的分类。该论对中间神经元放电模型的无监督分类具有较大的理论意义和实用价值。

1. Please provide a brief review of the applicant's thesis:

This Master's thesis systematically analyzes the firing patterns of cortical interneurons using ward's hierarchical clustering and iterative PCA clustering algorithms. The research results show that, compared to Ward's clustering algorithm, iterative PCA clustering analysis is more suitable for classifying interneuron firing patterns. This thesis has significant theoretical implications and practical value for the unsupervised classification of interneuron firing patterns.

Page 11-12 filled by supervisor, confirmed submision of applicant's thesis and offered comment of applicant's abillity for degree investigation. Including:

1. Introduction of applicant's thesis
2. Evaluation of applicant's knowledge, research ability, language proficiency and academic attitude.
3. Confirmed thesis independently completion without academic misconduct.

二、对申请人理论水平、研究能力、外语程度、治学态度的综合评语:

经过硕士阶段的训练，申请人有较好的理论水平和研究能力。可熟练书写和阅读英文专业材料。在团队合作和与人交流方面有待进一步提高。

三、论文是否在导师指导下由本人独立完成？申请人是否存在学术违规行为？是否同意送审？

论文在导师指导下由申请人独立完成，不存在学术违规行为，同意送审。

指导教师（签名）：

2019年12月11日

2. Comprehensive evaluation of the applicant's Theoretical knowledge, Research ability, language proficiency, academic attitude.

After completing the Master's program, the applicant has demonstrated a good level of theoretical knowledge and research ability. She is proficient in writing and reading professional materials in English. However, further improvement is needed in teamwork and communication skills.

3. Was the thesis independently completed by the applicant under the guidance of the supervisor? Does the applicant have any academic misconduct? Do you agree to submit it for review?

The thesis was independently completed by the applicant under the supervisor's guidance, and no academic misconduct was found. I agree to submit the thesis for review.

Supervisor (Signature): 

Prof. Yu Yongchun

2019年12月11日
Dec. 11th, 2019

学位审查 (一): 课程审查

粘贴《复旦大学研究生课程成绩单》(原件)

类别	课程名称	学分	起讫时间	成绩	类别	课程名称			学分	起讫时间	成绩
						必修课	选修课	实践环节			
中国特色社会主义理论与实践研究		2	16.9-17.1	B	必修课	体有选择课	17.2-17.6	9	A-		
自然辩证法		1	16.9-17.1	B-	选修课	神经环路:从基因到功能	16.9-17.1	3	A		
学术英语		2	16.9-17.1	B-	选修课	激光显微成像技术及细胞工作站	16.9-17.1	2	B+		
医学英语写作		2	17.2-17.6	C-	选修课	激光显微成像技术原理与实践	17.2-17.6	2	B+		
神经生物学前沿技术进展与实践		3	17.2-17.6	B-	必修课	医学统计方法	16.9-17.1	3	C+		
神经科学概论		3	17.2-17.6	B	必修课	UNIVERSITY	16.9-17.1	2	P		
实用形态学与分子生物学技术		3	16.9-17.1	B+	必修课	UNIVERSITY	18.3-18.7	2	P		
高级神经生物学		3	16.9-17.1	C+	必修课	UNIVERSITY	18.3-18.7	2	P		
脑功能和脑疾病研究进展		2	17.2-17.6	B+	必修课	以下空白	17.2-17.6	3	C+		
专业(一)		2	18.3-18.7	B+	必修课	UNIVERSITY	18.3-18.7	2	P		
专业外语		1	18.3-18.7	B-	必修课	UNIVERSITY	18.3-18.7	1	B+		
以下空白					实践环节						
学位课					实践环节						

制表人: 郑邦
主管校长: 周莹

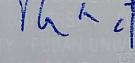
注印日期: 2019年12月24日

Degree Investigation (I): Courses Review

Pasting the original version of 'Fudan University Transcript for Master'

TRANSCRIPT FOR MASTER

FUDAN UNIVERSITY 德复旦大学

Student Information				
Name:	Zhou Ying	Student number:	16211520021	
		Student category:	Postgraduate Student (Diploma Program)	
		Education record:	Graduation	
		School system:	3 years	
		First-class discipline:	Biology	
		Total credit:	38	
		GPA:	2.99	
Compulsory Course				
Period of Study	Credit	Grade	Optional Course	
Study of the Theory and Practice of Socialism with Chinese Characteristics	16.9-17.1	2	B	Optional Courses in Sports
Dialectics of Nature	16.9-17.1	1	B-	Neural circuit: from gene to function
English For Academic Purpose(HAP,Medicine)	16.9-17.1	2	B-	Optical Image in Neuroscience
Medical English Writing	17.2-17.6	2	C-	Patch-Clamp Techniques
Advanced technologies and their applications in neuroscience research	17.2-17.6	3	B+	Methods of Medical Statistics
An Introduction to Neuroscience	17.2-17.6	3	B	The following is required sector
Practical Techniques for Morphology and Molecular Biology	16.9-17.1	3	B+	Practice
Advanced Neurobiology	16.9-17.1	3	C+	Academic Activity
Progress in Brain Functions and Diseases	17.2-17.6	2	B+	Following blank
Major Course I	18.3-18.7	2	B+	Foreign Languages for Special Fields of Study
Following blank	18.3-18.7	1	B+	
Lister: 				
President:  University Seal				
Issue Date: 2019-12-26				

Note: The Fudan University Master's transcript is available in both Chinese and English and has been entered into the digital management system, so pasting is not required on this form. The two scanned versions of the transcript above are provided for clarity. Additionally, the form on the following page is also left blank for the same reason.

已获得总学分		已获得学位课总学分		学位课程平均成绩	
--------	--	-----------	--	----------	--

院系审核意见：

经审核，学位申请人的课程成绩达到申请硕士学位要求。

研究生秘书（签名）：



学位审查（二）：评阅审查

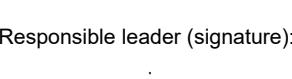
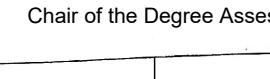
学位论文评阅起止时间		2019年10月18日至2019年11月30日	
学位论文 评阅人	姓名	职称	工作单位
	彭刚	研究员	复旦大学脑科学研究院
	何苗	研究员	复旦大学脑科学研究院
	何水金	研究员	复旦大学脑科学研究院 上海科技大学
学位论文 评阅结果		评阅专家共3人，同意答辩的3人，略作修改后答辩的0人，须作重大修改重新送审通过后答辩的0人，不同意答辩的0人。 评阅结果：通过(√)，不通过()。	

Total credits earned		Total credits earned for degree courses		Average grade for degree courses	
Department review opinion: Upon review, the applicant's course grades meet the requirements for applying for a master's degree.					
Graduate Secretary (Signature): Date:					
<p style="color: red;">Degree Investigation (II) section list information of three reviewers and summary results of thesis review. Every reviewer received and feedback a evaluation form (not shown here) as supplemental resource in archive. Only got more than half agreement of reviewers can enter next thesis defense process.</p> <p style="color: black;">Degree Investigation (II): Thesis review</p>					
Review of the Thesis Thesis review period			From October 18, 2019, to November 30, 2019		
Thesis reviewers	Name	Title	Affiliation		
	Peng Gang	Investigator	Fudan University Institute of Brain Science		
	He Miao	Investigator	Fudan University Institute of Brain Science		
	He Shuijin	Investigator	ShanghaiTech University		
Thesis review results		A total of 3 reviewers, 3 agreed to the defense, 0 agreed to the defense with minor revisions, 0 required major revisions and resubmission for approval before defense, 0 did not agree to the defense. Review result: Passed (checked).			

学位审查 (三): 答辩审查

Degree Investigation (III): Defense

拟组织学位论文答辩委员会成员名单			
职责	姓名	职称	工作单位
主席	李乾	教授	上海交通大学基础医学院
答辩委员	解云礼	研究员	复旦大学脑科学研究院
	涂颖	研究员	复旦大学脑科学研究院
秘书	傅颖慧		复旦大学脑科学研究院
拟定学位论文答辩时间		2019年12月3日	
院系审核意见:			
分管领导 (签名)  年 月 日			
学位评定分委员会审核意见:			
学位评定分委员会主席 (签名): 年 月 日			
学位论文答辩表决结果	答辩日期: 2019年12月3日		
	答辩平均成绩: 92.32分		
	总体评价: 优秀 (✓), 良好 (), 一般 (), 差 ()。		
	答辩委员会成员出席 3 人, 其中: 同意授予学位 3 人, 不同意授予学位 0 人; 建议授予 (不授予) 硕士学位。		

Proposed list of members for the thesis defense committee:			
Responsibilities	Name	Title	Work Unit
Defense Committee Members	Chair: Li Qian	Professor	Shanghai Jiao Tong University, School of Basic Medical Sciences
	Xi Yunli	Investigator	Fudan University, Brain Science Research Institute
	Zhu Ying	Investigator	Fudan University, Brain Science Research Institute
Secretary	Fu Yinghui		Fudan University, Brain Science Research Institute
Proposed date for thesis defense		December 3, 2019	
Department review comments:			
Responsible leader (signature): 			
Comments from the Degree Assessment Subcommittee:			
Chair of the Degree Assessment Subcommittee (signature): 			
Results of the thesis defense vote	Defense date: December 3rd, 2019		
	Average defense score: 92.32 points Overall evaluation: Excellent (checked)		
	3 committee members attended defense, among which: 3 members agreed to grant the degree; 0 members disagreed to grant the degree; Recommendation to grant a Master's degree (Checked).		

复旦大学硕士学位论文答辩评分表

答辩人姓名	周莹		学号	16211520021
专业(领域)名称	神经生物学			
学位论文题目	应用Ward层次聚类和迭代主成分分析皮层中间神经元电生理类型			
总得分	92.32	总体评价	优秀	

(平均成绩)
前科学研究院

一、论文选题和文献综述 20分

- 评审要素: (1) 课题的理论意义或实用价值, 包括对学科发展、经济建设、科技进步或社会发展的作用
 (2) 对本研究领域文献资料掌握的程度
 a. 对本课题的国内外研究动态的掌握是否全面及其评述是否恰当
 b. 对本论文所要解决的问题的目的及意义是否有清楚的论述

得分 18.33

二、研究成果 30分

- 评审要素: (1) 研究成果的理论意义或实用价值
 (2) 研究成果的创造性
 (3) 论文的工作量及难易程度

得分 27.66

三、专业能力 30分

- 评审要素: (1) 作者是否具有独立从事科学研究工作的能力
 (2) 作者是否掌握坚实的理论基础和系统的专业知识

得分 28.33

四、学风和写作水平 10分

- 评审要素: 书写规范、分析严谨;
 数据真实、结论正确。

得分 9

五、答辩水平 10分

- 评审要素: 概念明确、思路清晰;
 表达流畅、应答切题。

得分 9

Note: From this page, following resources collected from defense committee members as complementary resources. Average Score calculated by defense secretary when had collected all score and vote forms.

Fudan University Master's Thesis Defense Scoring Form

(Average Score)

Defender's Name	ZHOU YING	Student ID	16211520021
Program (Field) Name	Neurobiology		
Thesis Title	Classification of Electrophysiological Types of Cortical Interneurons Using Ward's Hierarchical Clustering and Iterative PCA Clustering		
Total Score	92.32	Overall Evaluation	Excellent

I. Thesis Topic and Literature Review (20 points)

Review Criteria:

- (1) Theoretical significance or practical value of the topic, including its role in the development of the discipline, economic growth, technological progress, or societal development.
 (2) Mastery of the literature in the research field:
 a. Whether the understanding of domestic and international research trends on the topic is comprehensive, and whether the review is appropriate.
 b. Whether the purpose and significance of the issues addressed in the thesis are clearly discussed.

Score 18.33

II. Research Achievements (30 points)

Review Criteria:

- (1) Theoretical significance or practical value of the research achievements.
 (2) Originality of the research outcomes.
 (3) Workload and level of difficulty of the thesis.

Score 27.66

III. Professional Competence (30 points)

Review Criteria:

- (1) Whether the author possesses the ability to conduct independent scientific research.
 (2) Whether the author has a solid theoretical foundation and systematic professional knowledge.

Score 28.33

IV. Writing and Academic Standard (10 points)

Review Criteria:

- (1) Writing is standardized, and analysis is rigorous.
 (2) Data is authentic, and conclusions are correct.

Score 9

V. Defense Performance (10 points)

Review Criteria:

- (1) Concepts are clear, and the thought process is logical.
 (2) Expression is fluent, and responses are relevant.

Score 9

(注: 总得分≥90分为优秀, 75~89分为良好, 60~74分为一般, ≤59分为差。)

(Note: Total score ≥ 90 is Excellent, 75-89 is Good, 60-74 is Average, ≤ 59 is Poor.)

复旦大学硕士学位论文答辩评分表

答辩人姓名	周莹	学号	16211520021
专业(领域)名称	神经生物学		
学位论文题目	应用Woolf层叠模型和迭代式成分分析发展中间神经元电生理类型		
总得分	90	总体评价	优秀

一、论文选题和文献综述 20 分

评审要素: (1) 课题的理论意义及实用价值, 包括对学科发展、
经济建设、科技进步及社会发展的作用
得分 18

(2) 对本研究领域的国内外研究动态的掌握是否全面及其评述是否恰切
a. 对本课题的国内外研究动态的掌握是否全面及其评述是否恰切
b. 对本论文所要解决的问题的目的及意义是否有清楚的论述

二、研究成果 30 分

评审要素: (1) 研究成果的理论意义及实用价值
(2) 研究成果的创造性
(3) 论文的工作量及难易程度
得分 28

三、专业能力 30 分

评审要素: (1) 作者是否具有独立从事科学研究工作的能力
(2) 作者是否掌握坚实的理论基础和系统的专业知识
得分 27

四、学风和写作水平 10 分

评审要素: 书写规范、分析严谨;
数据真实、结论正确。
得分 9

五、答辩水平 10 分

评审要素: 概念明确、思路清晰;
表达流畅、应答切题。
得分 8

(注: 总得分≥90分为优秀, 75~89分为良好, 60~74分为一般, ≤59分为差。)

复旦大学硕士学位论文答辩评分表

答辩人姓名	周莹	学号	16211520021
专业(领域)名称	神经生物学		
学位论文题目	应用Woolf层叠模型和迭代式成分分析发展中间神经元电生理类型		
总得分	96	总体评价	优秀

一、论文选题和文献综述 20 分

评审要素: (1) 课题的理论意义及实用价值, 包括对学科发展、
经济建设、科技进步及社会发展的作用
得分 19

(2) 对本研究领域的国内外研究动态的掌握是否全面及其评述是否恰切
a. 对本课题的国内外研究动态的掌握是否全面及其评述是否恰切
b. 对本论文所要解决的问题的目的及意义是否有清楚的论述

二、研究成果 30 分

评审要素: (1) 研究成果的理论意义及实用价值
(2) 研究成果的创造性
(3) 论文的工作量及难易程度
得分 28

三、专业能力 30 分

评审要素: (1) 作者是否具有独立从事科学研究工作的能力
(2) 作者是否掌握坚实的理论基础和系统的专业知识
得分 30

四、学风和写作水平 10 分

评审要素: 书写规范、分析严谨;
数据真实、结论正确。
得分 9

五、答辩水平 10 分

评审要素: 概念明确、思路清晰;
表达流畅、应答切题。
得分 10

复旦大学硕士学位论文答辩评分表

答辩人姓名	周莹	学号	16211520021
专业(领域)名称	神经生物学		
学位论文题目	应用Woolf层叠模型和迭代式成分分析发展中间神经元电生理类型		
总得分	91	总体评价	优秀

一、论文选题和文献综述 20 分

评审要素: (1) 课题的理论意义及实用价值, 包括对学科发展、
经济建设、科技进步及社会发展的作用
得分 18

(2) 对本研究领域的国内外研究动态的掌握是否全面及其评述是否恰切
a. 对本课题的国内外研究动态的掌握是否全面及其评述是否恰切
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二、研究成果 30 分

评审要素: (1) 研究成果的理论意义及实用价值
(2) 研究成果的创造性
(3) 论文的工作量及难易程度
得分 27

三、专业能力 30 分

评审要素: (1) 作者是否具有独立从事科学研究工作的能力
(2) 作者是否掌握坚实的理论基础和系统的专业知识
得分 28

四、学风和写作水平 10 分

评审要素: 书写规范、分析严谨;
数据真实、结论正确。
得分 9

五、答辩水平 10 分

评审要素: 概念明确、思路清晰;
表达流畅、应答切题。
得分 9

(注: 总得分≥90分为优秀, 75~89分为良好, 60~74分为一般, ≤59分为差。)

复旦大学硕士学位论文答辩表决票



答辩人姓名: 周莹 学号: 16211520021
专业(领域)名称: 神经生物学
学位论文题目: 应用Woolf层叠模型和迭代式成分分析发展中间神经元电生理类型

一、毕业答辩通过与否的评定: (适用于学生成生)

通过	不通过
<input type="radio"/>	

二、授予学位的建议:

同意	不同意	授予硕士学位
同意修改论文后重新答辩一次(一年内)	不同意修改论文后重新答辩	
<input type="radio"/>		

说明:

1. 采用无记名投票方式。

2. 是否同意, 请在相应的空格内划“○”。

2019年12月3日

复旦大学硕士学位论文答辩表决票



答辩人姓名: 周莹 学号: 16211520021
专业(领域)名称: 神经生物学
学位论文题目: 应用Woolf层叠模型和迭代式成分分析发展中间神经元电生理类型

一、毕业答辩通过与否的评定: (适用于学生成生)

通过	不通过
<input type="radio"/>	

二、授予学位的建议:

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<input type="radio"/>		

说明:

1. 采用无记名投票方式。

2. 是否同意, 请在相应的空格内划“○”。

2019年12月3日

Original scan evaluation form and vote of every committee members are shown in here without English Translation. Because all contents same as average form.

Vote paper used "O" marking Pass or not pass and agree or not disagree. I got pass and agreement with excellent evaluation (more than 90 points) from all members.