

International Workshop on Mathematical Image  
Processing: Models, Theory and Algorithms  
“数学图像处理的模型、理论和算法”国际研讨会  
(2018年4月13-15日)

# 日程表



江苏·南京

主办：南京邮电大学  
江苏省数学学会

# 南京邮电大学

南京邮电大学是国家“双一流”建设高校和江苏高水平大学建设高校，其前身是1942年诞生于山东抗日根据地的战邮干训班，是我党、我军早期系统培养通信人才的学校之一。1958年经国务院批准改建为南京邮电学院。2005年4月更为现名。目前学校已发展成为一所以工学为主体，以信息学科为特色，理、工、经、管、文、教、艺、法等多学科相互交融，博士、硕士、本科等多层次教育协调发展的高校。

学校现有博士后流动站3个，一级学科博士学位授权点3个、二级学科博士学位授权点14个，一级学科硕士学位授权点21个、二级学科硕士学位授权点32个，专业学位授权点（领域）15个，本科专业55个。目前有4个学科进入ESI学科排名全球前1%，国家重点学科（培育点）1个，国家特色专业建设点7个，4个专业通过国家工程教育专业认证，国家级卓越计划专业8个。作为主要协同单位入选国家“2011协同创新中心”2个，作为牵头单位入选省“2011计划”协同创新中心2个。现有各类在籍生3万余人。

学校现有教职工2300余人，其中博士生、硕士生导师750人，具有高级专业技术职务的占57.71%，具有博士、硕士学位的占93.74%。现有中国科学院院士（含双聘）6人，教育部“长江学者”特聘教授3人，教育部“长江学者”讲座教授1人，教育部“长江学者”青年学者3人，“国家杰出青年基金”获得者3人，国家百千万人才工程4人，国家“千人计划”9人，“青年千人计划”2人，国家“万人计划”领军人才3人，国家“万人计划”青年拔尖人才1人，国家“优秀青年科学基金获得者”6人，国家教学名师1人，全国优秀教师1人。

近三年，承担国家“973计划”、“863计划”、国家科技重大专项、国家科技支撑计划、国家重大科研仪器研制项目和国家自然科学基金项目、国家社科基金项目等各类国家级科研课题335项，发表学术论文15000多篇，其中6300多篇被SCI、EI、CPCI-S收录。

学校具有良好的教学、科研支撑条件。图书馆拥有纸质文献藏书量211万余册，其中信息、通信、电子等专业文献齐全、富有特色。学校人才培养工作成绩显著，在教育部本科教学工作水平评估中取得优秀。“十二五”以来，累计获省部级以上奖励3634项。70多年来，学校为国家输送了各类优秀人才10万余名，很多成为我国信息产业的领军人物、技术精英和管理骨干，享有“华夏IT英才的摇篮”之誉。

## 一、会议日程总体安排

日期	时间	议程	地点
4月13日 (星期五)	13:00-18:00	注册, 报到	新地酒店一楼大厅
	18:00-20:00	晚餐	新地酒店零点餐厅
4月14日 (星期六) 上午	08:20-08:30	开幕式	理学学科楼 教2-314
	08:30-08:40	合影	室外
	08:40-11:50	大会报告1	理学学科楼 教2-314
	11:50-12:20	午餐	
4月14日 (星期六) 下午	14:00-18:10	大会报告2	理学学科楼 教2-314
	18:30	欢迎晚餐	新地酒店牡丹厅
4月15日 (星期日)	08:20-12:00	大会报告3	理学学科楼 教2-314
	12:00	午餐	
	午后	离会	

**会务组组长：**温勇、唐加山

**成员：**金正猛、朱洪强、武婷婷、杨真真、闵莉花、赵春梅

**会议联系人：**金正猛，13913036438

**后勤联系人：**朱洪强，18951650103

**接待联系人：**武婷婷，18951650019

## 二、4月13日（星期五）日程安排

13:00-18:00	注册，报到	地点：新地酒店一楼大厅
18:00-20:00	晚餐	地点：新地酒店零点餐厅

## 三、4月14日（星期六）日程安排

开幕式（08:20-08:40） 地点：理学学科楼 教2-314		
08:20-08:30	主持人： 温勇教授	南京邮电大学副校长李建宇教授致欢迎辞
08:30-08:40	合影（室外）	

大会报告1（08:40-11:50） 地点：理学学科楼 2-314		
08:40-09:10	主持人： 杨孝平教授	报告人：Micahael Ng (Hong Kong Baptist University) Multi-Label Classification by Semi-Supervised Singular Value Decomposition
09:10-09:40	主持人： 李雷教授	报告人：雷皓（中国科学院武汉物理与数学研究所） 磁共振成像图像处理中的数学问题
09:40-10:10	主持人： 王友国教授	报告人：董彬（北京大学） “Deep Revolution” in Image Restoration and Beyond
10:10-10:20	茶歇	
10:20-10:50	主持人： 赵培标教授	报告人：曾铁勇（The Chinese University of Hong Kong） Convex and Non-Convex Optimization in Image Recovery and Segmentation

10:50-11:20	主持人: 宋长明教授	报告人: 吴春林 (南开大学) A General Truncated Regularization Framework for Contrast-Preserving Variational Signal and Image Restoration: Motivation and Implementation
11:20-11:50	主持人: 李敏教授	报告人: 崔宰珪 (上海交通大学) PET-MRI Joint Reconstruction by Joint Sparsity Based Tight Frame Regularization
11:50-12:20	工作餐, 地点: 理学学科楼 教2-314	

<b>大会报告2 (14:00-18:10)</b>		
地点: 理学学科楼 2-314		
14:00-14:30	主持人: 吕中学教授	报告人: 常谦顺 (江苏师范大学) An Adaptive Algorithm for TV-based Model of Three Norms in Image Restoration
14:30-15:00		报告人: 段玉萍 (天津大学) Accurate MR reconstruction with correction for intensity inhomogeneity
15:00-15:30	主持人: 顾国勇教授	报告人: 沈超敏 (华东师范大学) Global Nonlinear Metric Learning by Gluing Local Linear Metrics
15:30-16:00		报告人: 刘君 (北京师范大学) Normalized Cut with Adaptive Similarity and Spatial Regularization
16:00-16:10	茶歇	
16:10-16:40	主持人: 魏素花研究员	报告人: 沈纯理 (华东师范大学) 曲面点云图像的去噪、去模糊问题及其在脑电波 (EEG) 重建中的应用
16:40-17:10		报告人: 庞志峰 (河南大学) Half-quadratic adaptive $TV^p$ to the image restoration problem
17:10-17:40	主持人: 金正猛教授	报告人: 袁强强 (武汉大学) 深度学习在遥感信息质量改善中的应用
17:40-18:10		报告人: 张雄军 (华中师范大学) A Fast Algorithm for Deconvolution and Poisson Noise Removal
18:30	欢迎晚餐, 地点: 新地酒店牡丹厅	

### 三、4月15日（星期日）日程安排

大会报告3（08:20-12:00） 地点：理学学科楼 2-314		
08:20-08:50	主持人： 姚正安教授	报告人：姜明（北京大学） Asynchronous Parallel Computation for Image Reconstruction
08:50-09:20	主持人： 杨余飞教授	报告人：文有为（湖南师范大学） A Fast Proximal Gradient Algorithm For Single Particle Reconstruction of Cryo-EM
09:20-09:50	主持人： 唐加山教授	报告人：应时辉（上海大学） 基于流形分布的图像处理与分析
09:50-10:00	茶歇	
10:00-10:30	主持人： 郑敏玲教授	报告人：黄玉梅（兰州大学） Rank Minimization with Applications to Image Noise Removal
10:30-11:00		报告人：黎芳（华东师范大学） Image restoration with patch-based low rank regularization
11:00-11:30	主持人： 彭亚新教授	报告人：吕良福（天津大学） Weighted nuclear norm minimization for tensor completion using tensor-SVD
11:30-12:00		报告人：方发明（华东师范大学） Sparse Unmixing of Hyperspectral Images
12:00-12:30	工作餐，地点：理学学科楼 2-314	

## 四、报告题目和摘要

**Michael Ng (Hong Kong Baptist University)**

### **Multi-Label Classification by Semi-Supervised Singular Value Decomposition**

Multi-label problems arise in various domains, including automatic multimedia data categorization, and have generated significant interest in computer vision and machine learning community. In this talk, we proposed to use a semi-supervised singular value decomposition (SVD) to effectively capture the label correlations.

Experimental results for synthetic and real-world multimedia data sets demonstrate that the proposed method can exploit the label correlations and obtain promising and better label prediction results than the state-of-the-art methods.

**雷皓（中国科学院武汉物理与数学研究所）**

### **磁共振成像图像处理中的数学问题**

磁共振成像的技术瓶颈问题主要有两个：1）如何快速、廉价地获取图像，以降低MRI检查成本，使得高通量检查或筛查成为可能；2）如何从图像中提取定量、个体化的信息用于指导临床诊疗。这两个问题的最终解决都离不开数学。例如，稀疏采样平行快速成像是近年来发展起来的、并已得到广泛应用的快速成像方法，而该方法的实现在很大程度上依赖于压缩感知理论的提出和完善。著名数学家陶哲轩等在这方面起到了决定性的作用。磁共振图像信息的提取目前主要依靠两种方法：放射专家读片和基于统计方法的参数分析。前者可认为是个性化的信息提取，但在定量性、客观性、可重复性等方面可能存在不足；后者是定量、客观的分析，但尚不能高效实现个体化信息的提取。第二个瓶颈问题的解决需要数学不同分支的广泛参与，包括偏微分方程、流体几何、图论、模式识别、网络分析、模型选择、数理统计、复杂机器学习等。

**董彬（北京大学）**

### **“Deep Revolution” in Image Restoration and Beyond**

Deep learning continues to dominate machine learning. It is now widely used in many research areas in science and engineering, and has major industrial impacts. Deep learning methods have achieved remarkable results in a variety of tasks, especially in a supervised learning environment. They have surpassed, or as good as, human in Go, playing video games, accurately identifying objects in images and videos, diagnosing



certain diseases from medical images, etc.

In this talk, I will start with a brief review of classical (pre deep learning) image restoration methods, followed by some recent applications of deep learning in image restoration and image analysis. I will present my personal understanding of deep learning in image restoration from the perspective of applied mathematics, which inspired two of our recent work. One work is on combining numerical differential equation and deep convolutional architecture design. In this work, we interpret some of the state-of-the-art deep CNNs, such as ResNet, FractalNet, PolyNet, RevNet, etc., in terms of numerical (stochastic) differential equations; and to propose new deep architectures that can further improve the prediction accuracy of the existing networks in image classification. In the other work, we proposed an end-to-end model for imaging based diagnosis in medical imaging. Unlike traditional methods where image reconstruction and image recognition are treated as two separate steps, our end-to-end model merges the two steps into one. Our numerical experiments on a large scale real CT data set demonstrated the benefit of the proposed method.

曾铁勇（香港中文大学）

### **Convex and Non-Convex Optimization in Image Recovery and Segmentation**

We will report some progress on the convex and non-convex approaches for image restoration and segmentation.

吴春林（南开大学）

### **A General Truncated Regularization Framework for Contrast-Preserving Variational Signal and Image Restoration: Motivation and Implementation**

Variational methods have become an important kind of methods in signal and image restoration - a typical inverse problem. One important minimization model consists of the squared L2 data fidelity (corresponding to Gaussian noise) and a regularization term constructed by a potential function composed of first order difference operators. It is well known that total variation (TV) regularization, although achieved great successes, suffers from a contrast reduction effect. Using a typical signal, we show that, actually all convex regularizers and most nonconvex regularizers have this effect. With this motivation, we present a general truncated regularization framework. The potential function is a truncation of existing nonsmooth potential functions and thus flat from some positive  $t$ .

Some analysis in 1D theoretically demonstrate the good contrast-preserving ability of the framework. We also give optimization algorithms with convergence verification in 2D, where global minimizers of each subproblem (either convex or nonconvex) are calculated. Experiments numerically show the advantages of the framework.

崔宰珪（上海交通大学）

### **PET-MRI Joint Reconstruction by Joint Sparsity Based Tight Frame Regularization**

Recent technical advances lead to the coupling of PET and MRI scanners, enabling to acquire functional and anatomical data simultaneously. In this talk, we propose a tight frame based PET-MRI joint reconstruction model via the joint sparsity of tight frame coefficients. In addition, a non-convex balanced approach is adopted to take the different regularities of PET and MRI images into account. To solve the nonconvex and nonsmooth model, a proximal alternating minimization algorithm is proposed, and the global convergence is present based on Kurdyka-Lojasiewicz property. Finally, the numerical experiments show that our proposed models achieve better performance over the existing PET-MRI joint reconstruction models.

常谦顺（江苏师范大学）

### **An Adaptive Algorithm for TV-based Model of Three Norms in Image Restoration .**

段玉萍（天津大学）

#### **Accurate MR reconstruction with correction for intensity inhomogeneity**

High-field Magnetic Resonance Imaging (MRI) becomes popular due to the benefits of potential higher signal-to-noise ratio, contrast-to-noise ratios and spectral resolution, a byproduct of which is the intensity inhomogeneity (i.e., bias field). In this work, we develop a novel MRI reconstruction method by regarding the reconstructed image as a combination of the true intensity and a bias field. The undersampled MRI reconstruction is formulated as a least-square problem integrating with an inf-convolution of the first-order and second-order regularisers, and the shearlet transform. More specifically, we use the total variation and total variation of the gradient to guarantee the properties of the true intensity (piecewise constant) and bias field (spatially smooth). The shearlet transform is employed to capture the anisotropic features such as edges, curves, and so on. The proposed model is solved by splitting variables and Alternating Direction

Method of Multipliers (ADMM), where all subproblems have the closed-form solutions. Numerical experiments on both phantom and MRI data are conducted to demonstrate the advantageous of the proposed method in reconstruction of high-field MRI.

沈超敏 (华东师范大学)

### **Global Nonlinear Metric Learning by Gluing Local Linear Metrics**

We address the nonlinear metric learning by constructing a smooth nonlinear metric from the data. First, we locally define an initial linear metric on each cluster by principal component analysis. Second, we glue such local linear metrics to form a smooth nonlinear metric by a partition of unity on the sample space, and further learn the global nonlinear metric. Third, we conduct the intrinsic steepest descent algorithm on matrix manifolds for implementation. Finally, we compare our approach with several state-of-the-art methods on a variety of datasets. The results validate that the robustness and accuracy of classification are both improved under our nonlinear metric. The novelty of our global smooth nonlinear metric learning model lies in that it has completely overcome drawbacks of local metric learning methods: the partition coefficients obtained by the partition of unity is smooth, while the metric at any point on the manifold can be directly defined.

刘君 (北京师范大学)

### **Normalized Cut with Adaptive Similarity and Spatial Regularization**

In this talk, we propose a normalized cut segmentation algorithm with spatial regularization priority and adaptive similarity matrix. We integrate the well-known expectation-maximum(EM) method in statistics and the regularization technique in partial differential equation (PDE) method into the normalized cut. The introduced EM technique makes our method can adaptively update the similarity matrix. This step can be regarded as we build a simple generator to produce some better similarity matrices for classification criterion.

While the regularization priori can guarantee that the proposed algorithm uses a spatially regularized spectrum vector as discriminator to classify pixels. The generator and discriminator cooperate with each other and makes the proposed algorithm has a robust performance under noise.

To unify the three totally different methods including EM, spatial regularization, and

spectral graph clustering, we built a variational framework to combine them and get a general normalized cut segmentation algorithm. The well-defined theory of the proposed model is also given in the paper.

Compared with some existing spectral clustering methods such as the traditional normalized cut algorithm and the variational based Chan-Vese model, numerical experiments show that our methods can achieve promising segmentation performance.

沈纯理（华东师范大学）

### 曲面点云图像的去噪、去模糊问题及其在脑电波（EEG）重建中的应用

1. 曲面点云图像的去噪、去模糊处理的关键是对以连续方式或以离散点集方式表达的曲面上图像，如何去表达它的全变分(Total Variation).
2. 利用微分几何的方法对离散化的曲面  $S$  求出了曲面上各点的法向及主方向，并给出了曲面  $S$  上图像  $u$  的全变分  $TV(u)$  的具体表达式，从而图像  $u$  的去噪、去模糊问题就可归纳为常规的计算能量泛函的极小值问题。
3. 利用 Chambolle-Pock 方法及随机梯度算法快速求解泛函的极小值问题。
4. 我们将此方法应用于脑电波的重建问题，即根据脑电图电极的电位测量值 (measurable potentials at EEG electrodes)反推出脑电波的源值(EEG electrical source).

庞志峰（河南大学）

### Half-quadratic adaptive $TV^p$ to the image restoration problem

To keep structures in the restoration problem is very important via coupling the local information of the image with the proposed model. In this paper we propose a local self-adaptive  $\ell^p$ -regularization model for  $p \in (0,2)$  based on the total variation scheme, where the choice of  $p$  depends on the local structures described by the eigenvalues of the structure tensor. Since the proposed model as the classic  $\ell^p$  problem unifies two classes of optimization problems such as the nonconvex and nonsmooth problem when  $p \in (0,1)$ , and the convex and smooth problem when  $p \in (1,2)$ , it is generally challenging to find a ready algorithmic framework to solve it. Here we propose a new and robust numerical method via coupling with the half-quadratic scheme and the alternating direction method of multipliers(ADMM). The convergence of the proposed algorithm is established and the numerical experiments illustrate the possible advantages of the proposed model and numerical methods over some existing variational-based models and methods.

袁强强（武汉大学）

### 深度学习在遥感信息质量改善中的应用

遥感影像质量改善是遥感信息处理研究中的热门问题。针对传统的正则化模型方法存在参数依赖，普适性不足的缺点，本报告主要介绍本团队利用深度学习技术在遥感影像去噪、修复、多源信息融合以及定量反演方面所做的一些新的尝试。

张雄军（华中师范大学）

### A Fast Algorithm for Deconvolution and Poisson Noise Removal

Poisson noise removal problems have attracted much attention in recent years. The main aim of this paper is to study and propose an alternating minimization algorithm for Poisson noise removal with nonnegative constraint. The algorithm minimizes the sum of a Kullback-Leibler divergence term and a total variation term. We derive the algorithm by utilizing the quadratic penalty function technique. Moreover, the convergence of the proposed algorithm is also established under very mild conditions. Numerical comparisons between our approach and several state-of-the-art algorithms are presented to demonstrate the efficiency of our proposed algorithm. (This is a joint work with Michael K. Ng and Minru Bai).

姜明（北京大学）

### Asynchronous Parallel Computation for Image Reconstruction

With the rapid advance of computer hardware such as multi-core CPU/GPU, multi-node supercomputer, FPGA, asynchronous parallel computation becomes necessary for making the best use of such computing devices. In this talk, asynchronous parallel computation will be discussed from the following perspectives, including energy-efficiency, communication model, and architecture and implementation for iterative algorithms for image reconstruction. The implementation of the Mumford-shah regularization for x-ray CT and electron tomography is used as a demonstration for implementation.

文有为（湖南师范大学）

### A Fast Proximal Gradient Algorithm For Single Particle Reconstruction of Cryo-EM

We consider the problem of single particle reconstruction (SPR) from cryo-electron microscopy (cryo-EM), where the three-dimensional (3D) structure of particle is reconstructed from the many noisy two-dimension (2D) projected and blurred images. In this talking, single particle reconstruction is represented by solving an linear inverse problem with perturbations. Regularization method is applied to solve the linear system since it is ill-posed. We apply Fast Iterative Shrinkage-Thresholding Algorithm (FISTA) to find the solution of the  $L_1$  regularized optimization problem. Numerical experiments with simulated images demonstrate that the proposed methods significantly reduce the estimation error and improved reconstruction quality.

应时辉（上海大学）

### 基于流形分布的图像处理与分析

该报告针对基于影像组学的图像处理与分析方法进行介绍。特别是图像配准与标准化问题、纵向图像演化过程刻画。具体地，首先介绍两幅图像配准的数学模型与算法；其次，通过将图像在图像流形上的分布信息引入影像组标准化模型，得到无偏图谱建立方法；再次，通过图像流形上的路径回归方法，得到婴幼儿大脑发育过程的影像演化过程。

黄玉梅（兰州大学）

### Rank Minimization with Applications to Image Noise Removal

Rank minimization problem has a wide range of applications in different areas. However, since this problem is NP-hard and non-convex, the frequently used method is to replace the matrix rank minimization with nuclear norm minimization. Nuclear norm is the convex envelope of the matrix rank and it is more computationally tractable. Matrix completion is a special case of rank minimization problem. In this talk, we consider directly using matrix rank as the regularization term instead of nuclear norm in the cost function for matrix completion problem. The solution is analyzed and obtained by a hard-thresholding operation on the singular values of the observed matrix. Then by exploiting patch-based nonlocal self-similarity scheme, we apply the proposed rank minimization algorithm to remove white Gaussian additive noise in images. Gamma multiplicative noise is also removed in logarithm domain. The experimental results illustrate that the proposed algorithm can remove noises in images more efficiently than nuclear norm can do. And the results are also competitive with those obtained by using

the existing state-of-the-art noise removal methods in the literature.

黎芳（华东师范大学）

### **Image restoration with patch-based low rank regularization**

In this talk, we propose new decoupled variational models for image restoration based on patch-based low rank regularization with nuclear norm minimization. Some mathematical analysis of the models and the algorithms are given. The numerical experiments and comparisons on various images demonstrate the effectiveness of the proposed methods.

吕良福（天津大学）

### **Weighted nuclear norm minimization for tensor completion using tensor-SVD**

Tensor nuclear norm minimization as the extension of nuclear norm minimization in the field of tensor domain, has attracted extensive attention in the fields of computer vision and neuroscience. However, in order to obtain higher accuracy in practical application, many researchers prefer to using weighted tensor nuclear norm minimization rather than tensor nuclear norm minimization. Furthermore, a new tensor decomposition, which is called tensor-SVD, is proposed for utilizing the relationship among slices of tensor. In this paper, we propose the weighted tensor nuclear norm minimization to approximate tensor completion problem under the framework of tensor-SVD. Then we use alternating direction method of multipliers method solve it, verify the its convergence, and proof its limit point satisfying the KKT condition. Furthermore, our proposed method shows a significant improvement with respect to the accuracy in comparison with tensor nuclear norm minimization, and achieves state-of-the-art performance in typical low level vision tasks, including video completion, image inpainting et al.

方发明（华东师范大学）

### **Sparse Unmixing of Hyperspectral Images**

Spectral unmixing aims at estimating the proportions (abundances) of pure spectrums (endmembers) in each mixed pixel of hyperspectral data. Recently, the semi-supervised approach, which takes the spectral library as prior knowledge, has been

attracting much attention in unmixing. In this talk, we will present two new semi-supervised unmixing models. Firstly, we show a novel unmixing model combined with two effective regularization terms: a similarity-weighting constraint and the  $L_p$  ( $0 < p < 1$ ) norm sparse regularization. Secondly, a framelet-based sparse unmixing model is presented. This model can promote the abundance sparsity in framelet domain and discriminates the approximation and detail components of hyperspectral data after framelet decomposition. In both of the models, the iteration based algorithms are discussed to obtain the minimal solution. Experimental results on simulated and real data demonstrate that our models are promising.



## 南京邮电大学理学院

南京邮电大学理学院现有数学和物理学一级学科硕士学位授权点，应用统计硕士专业学位授权点，有数学、物理两个校级重点培育学科；有应用数学研究中心、非结构化数据计算理论与应用研究中心、信息物理研究中心、视觉认知计算与应用研究中心、先进功能陶瓷研究中心、数据科学与统计应用研究中心等多个学术研究中心。

学院现有信息与计算科学(省重点专业、省特色专业)、应用统计学(省重点专业、校特色专业)、应用物理学(省重点专业、校特色专业)等3个本科专业；现有2门省级精品课程，2个省级实验教学示范中心,2个中央地方共建实验室,1个江苏省工程实验室。

理学院现有教职工148人，其中教授16名、副教授66名，博士生、硕士生导师45名，省级教学名师1人，省“333高层次人才培养工程”2名，省“青蓝工程”人才7名，省“六大人才高峰”1名，学校“鼎新学者”6名。

学院近三年来在各级学术刊物上公开发表论文500余篇，其中被国际权威的SCI、EI等检索收录200余篇。主持国家自然科学基金22余项，国家社科基金1项，省部级科研项目20项。

学院教师指导学生参加学科竞赛，近三年来获各类奖励655项：其中国际级140项、国家级29项，省部级486项。大学生数学建模竞赛是理学院负责组织学生参加的重要赛事之一，自1996年参加国赛至今获国家级奖143项，其中2015年获全国一等奖五项，二等奖五项。2017年获数模美赛特等奖兼获SIAM奖。获国奖情况如下。

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国一		1	2	3	1	1	4	3	3	4	5	3	3	3	2	2	2	4	5	4	4	59
国二	1		1	2	3	4	4	2	2	4	4	1	7	5	7	8	7	6	5	6	5	84
合计	1	1	3	5	4	5	8	5	5	8	9	4	10	8	9	10	9	10	10	10	9	143

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