

February 13, 2023

Evidence of performance for the Faculty Evaluation and Salary Increase Committee (FESIC)

Name: Victor Patrangenaru

Rank: professor

Note: The evaluation period is calendar year 2022.

A. Teaching Assignments

1. Courses Taught: Please list all courses taught during the calendar year 2022. Indicate the enrollment, the semester in which it was taught, and whether it was taught for the first time (courses taught for the first time are marked with an asterisk).

Semester	Course number	Course Name	Type	Enrolled
Fall 2022	STA4702	APPL MULTIVAR ANALYSIS	Class Lecture	4
Fall 2022	STA5707	APPL MULTIVAR ANALYSIS	Class Lecture	3
Fall 2022	STA6906	DIR INDIV STUDY	Online	1
Fall 2022	STA6980	DISSERTATION	Online Grad. Dissertation	4
Fall 2022	STA8985	DISSERTATION DEFENSE	Online	1
Summer 2022	MAT4321	INTRO MATH STAT	FLEX	9
Summer 2022	MAT5323	INTRO MATH STAT	FLEX	1
Summer 2022	STA6980	DISSERTATION	Graduate Dissertation	2
Spring 2022	MAT4322	MATH STAT	FLEX	20
Spring 2022	MAT5325	MATH STAT	FLEX	3
Spring 2022	STA6557	OBJECT DATA ANALYSIS	Class Lecture- optional	6
Spring 2022	STA6980	DISSERTATION	Graduate Dissertation	4

c. Course syllabus including text, outline, objectives, homework policy, number and types of exams and grading scale. This is the material that is supposed to be given to classes on the first day. **UPLOADED ON FACULTY HOMEPAGE - ACCESSIBLE AS A SEPARATE ELECTRONIC FOLDER-syllabi2022vp**

d. Copies of quizzes, tests and final exams. (Give only a sample if quizzes are daily or weekly.) **UPLOADED ON FACULTY HOMEPAGE - ACCESSIBLE AS A SEPARATE ELECTRONIC**

FOLDER exams2022vp. There were many final presentations, in different formats; these were included in that folder, that was too large to be e-mailed. .

e. SAVE THE TREES COURSES. Course materials taught by \vec{V} . Patrangenaru, including Lecture Notes are posted online-see below.

f. Other material which may be relevant, such as homeworks, supplementary handouts, descriptions of or requirements for papers and projects, description of innovative teaching methods, etc. Course material for each course taught, semester and online address are given in the following table. These materials include presentations by students as final projects, that were included in the exams file made available to Pam, in the exams folder (see d. above). Every year students are sending Patrangenaru thank you notes, directly, or via the Center for the Advancement of Teaching. Such notes mean a lot to him.

Course number	Semester Taught	Online course page
STA4322	Spring 2022	http://stat.fsu.edu/~vic/4322-5325-2022
STA6557	Spring 2022	http://stat.fsu.edu/~vic/6557-2022
STA4321	Summer 2022	http://stat.fsu.edu/~vic/4321-5323
STA5323	Summer 2022	http://stat.fsu.edu/~vic/4321-5323
STA4702	Fall 2022	http://stat.fsu.edu/~vic/5707-4702-2022
STA5707	Fall 2022	http://stat.fsu.edu/~vic/5707-4702-2022

2. Graduate degrees awarded: List those graduate students who **should have** received degrees under your direction in the evaluation period.

i. Student Name - Seunghee Choi

Research Area - *Extraction and Analysis of 2D and 3D Data from Images and of Phlogenetic Tree Data from RNA and DNA Sequences and Estimation of Spherical Depth on Object Spaces*

Program - PhD Statist Year degree should have been awarded - 2022

ii. Student Name - Omar Alharthi

Research Area - *Nonparametric Statistics on Stratified Spaces With Applications*

Program - MSci Statist Year degree was awarded - 2022

3. Graduate student direction: List those graduate students whose work you directed during the year but who did not receive degrees.

Student Name	Research Area	Program
Adam Dixon	<i>Topological Data Analysis and RNA Analysis</i>	PhD Statist
Aaid Algahtani	<i>Two Sample Tests for Extrinsic Antimeans on Kendall Planar Shape Spaces</i>	PhD Statist
Seunghee Choi	<i>Spherical Depth, Oriented Projective Shape Analysis, 3D Printing</i>	PhD Statist
Ka Chun Wong	<i>Advances in Projective Shape Analysis and RGB Analysis</i>	PhD Statist
Garett Ordway	<i>Advances in Functional Data Analysis</i>	PhD Statist

There were additional students *formally* assigned to be advised by Patrangenaru in 2022; their names are not listed here, as Patrangenaru advises them only on departmental course requirements; records of signatures on their course work are not kept on file.

4. **Graduate student committees: List those graduate students on whose supervisory committees you served but for whom you were not a Major Professor.**

University Rep on Emil Lobachev's PhD supervisory committee, Department of Electrical and Computer Engineering, FSU (chair Petru Andrei).

Member on Mehdi Abdi Anbouhi's PhD supervisory committee. Defended his PhD dissertation in June 2022. Major professor - Washington Mio.

5. **Undergraduate student committees: List those undergraduate honor students committee whose supervisory committees you served but for whom you were not a committee chair:**

none in 2022.

B. Research Assignments

Include a copy of every paper that is listed in this section.

1. Papers published: Please list by citation all papers of which you are an author or co-author that have appeared in print or online from January 1 to December 21, 2022.

1. Seunghee Choi, Rob L. Paige and **Vic Patrangenaru**(2022). Oriented Projective Shape Analysis. *BSG Proceedings* , **29**, 1–11. <http://www.mathem.pub.ro/proc/bsgp-28/K29-ch-ZKP94.pdf>

2. Papers in press: Please list by citation all such papers that have been accepted.

3. Papers submitted: Please list all papers that have been submitted for publication but are not yet accepted. For each paper, indicate the kind of editorial response or whether no editorial response has been received.

1. A. Algahtani and **V. Patrangenaru** (2022). Two Sample Test for Extrinsic Antimeans on Planar Kendall Shape Spaces with an Application to Medical Imaging -*submitted, under review at Annals of Statistics*.

2. H. Lee and **V. Patrangenaru** (2022). Extrinsic Kernel Ridge Regression Classifier for Kendall's Planar Shape Space. *withdrawn, due to lack of response. To be submitted at another journal*.

3. **V. Patrangenaru**, Chen Shen and R. Moore (2022). CLT on Stratified Spaces with an Application to Phylogenies of SARS-CoV-2 Data Analysis. *Submitted at J. of Nonparametric Statistics*.

4. A. Dixon, **V. Patrangenaru** and R. Moore(2022). Analysis on Stratified Spaces and an RNA Based Investigation of two SARS-CoV-2 Hypotheses. *Submitted at J. of Nonparametric Statistics*.

5. R. Guo, H. Lee and V. Patrangenaru (2022). Test for Homogeneity of Random Objects on Manifolds with Applications to Biological Shape Analysis. *Sankhya A*. Revision submitted.

Invited textbooks contract - most book chapters already took shape. Expected to be submitted in 2023.

1. **V. Patrangenaru** and Daniel E. Osborne (2022). *Nonparametric Statistics for Data on Stratified Spaces with Applications to Image Analysis and Their Applications to Object Data Analysis*. Chapman&Hall/CRC.

2. Rob L. Paige and **V. Patrangenaru**(2022). *Geometric-Topological Statistical Methods for the Analysis of Image Data in R*. Chapman&Hall/CRC.

4. Papers given at meetings: Please list by citation the abstracts of all papers of which you were an author given at meetings during the evaluation period.

0. **V. Patrangenaru** *Geometry, Topology and Statistics on Object Spaces* Geometry, Topology and Statistics in Data Sciences 10 -14 Oct 2022, IHP, Paris, France. Invited.

Abstract. The birth certificate of Statistics, as a mathematical science, is the Central Limit Theorem (CLT), showing that under general assumptions, the distribution of the standardized sample mean follows a standard normal distribution. In this talk one discusses the extension of the CLT to a random object on a smooth object space, and on a stratified space in general, by detailing the case of a random point on a tree, and in particular on a spider. As an application of such ideas, one investigates two possible origins of SARS-CoV-2, using an RNA analysis on rooted tree spaces
 Postponed, due to acute medical condition prohibitive of long distance travel, at the time of the meeting

1. **V. Patrangenaru** and R.L. Paige. *RCD and TDA for 2D Scenes Extracted From Electronic Images*. AISC2022, Oct. 8-10, 2022, Greensboro, NC. Invited.

Abstract. Electronic image data has a major impact in essentially all human endeavors, including Agriculture, Manufacturing, Biometrics, Business, Defense, Emergency Management, Engineering, Medicine, and more generally Science and Technology. The statistical analysis of images is challenging due to the high dimensionality and nonlinear nature of the feature space of configurations extracted from imaging data. We consider statistical and topological data analysis of 2D image data. In the first part of this talk, we consider methodologies based on the Region Covariance Descriptor (RCD). The second part is dedicated to Topological Data Analysis (TDA) based on simplicial and cubical persistent homologies. Our 2D example concerns images of leaf data from Qiu et al. (2019), which consists of images of two leaves-A and B- from the same tree, twenty pictures being taken of each leaf from different perspectives. These novel statistical procedures are used for correctly determining that leaf A images and leaf B images are in fact those of different leaves and also for correctly classifying new out-of-sample leaf images. **Keywords:** Distance-based Statistical Inference, Image Analysis, Topological Data Analysis

References

[1] M. Qiu, R. Paige and V. Patrangenaru (2019). A nonparametric approach to 3D projective shape analysis from digital camera images-II. *Journal of Applied Statistics*. **46**. 2677–2699.

2. **V. Patrangenaru**, R.L.Paige and A. Algahtani. *A statistical and topological data analysis of 2D and 3D scenes extracted from electronic images*. The XVIth International Conference DGDS-2022, University Politehnica of Bucharest, Romania. *September 1-3, 2022*. Invited, online.

Abstract. With advancements of technology over the past few years, digital imaging data has grown significantly. Such data is analyzed here using statistical shape analysis. It is important to develop theoretical methods to perform the analysis in a nonparametric way. One develops non-parametric procedures for comparing two extrinsic mean or antimeans on the oriented projective shape space of k -ads in general position in $\vec{P}(\mathbb{R}^{m+1})$. associated with \mathbb{R}^{m+1} . Applications to 3D bioshape analysis for data extracted from digital camera images are introduced. For small samples, the test is based on Efron’s nonparametric bootstrap.

3. **V. Patrangenaru**, Roland Moore and Chen Shen. *CLT on Stratified Spaces with an application to phylogenies of SARS-CoV-2 data analysis*. ISNPS2022 International Symposium on Nonparametric Statistics, *June 20-24, 2022*, Paphos, Cyprus. Invited.

Abstract

Important additions to the MSC2020 were made with the introduction of 62R20 - Statistics on metric spaces and 62R30 Statistics on manifolds. From the perspective of nonparametric estimation of location parameters, the complete separable metric structure on an object space leads to consistency of Fréchet sample means and antimeans of distributions to their population counterparts. This general metric structure is nevertheless insufficient for proving asymptotic results for such indices. A richer metric structure, allowing for some level of smoothness to prove the CLT was needed. Such a structure on an object space, first introduced at CRM 2011 (see Bhattacharya et al(2013)[1]) is that of stratified space. Special cases of interest are BHV spaces, and rooted tree spaces (Moore et al(2021)[2], which in case of trees with three leafs are open books (Hotz et al(2013)[4]). Here, for simplicity we analyze the behavior of intrinsic means of distributions of SARS-CoV-2 RNA sequences from various parts of the World (Shen(2021)[3]).

References

- [1] Bhattacharya, Rabi N.; Buiba, Marius; Dryden, Ian L.; Ellingson, Leif A.; Groisser, David; Hendriks, Harrie; Huckemann, Stephan; Le, Huiling; Liu, Xiuwen; Marron, James S.; Osborne, Daniel E.; Patrangenaru, Vic; Schwartzman, Armin; Thompson, Hilary W.; Wood, Andrew T. A. (2013) Extrinsic data analysis on sample spaces with a manifold stratification. *Advances in mathematics*, 241-251, Ed. Acad. Romne, Bucharest, 2013.
- [2] Moore, R., Patrangenaru, V. and Dixon, Adam (2021). Investigating two possible Origins of SARS-CoV-2 - an RNA Analysis on Tree Spaces. Technical Report 1015. <https://stat.fsu.edu/technical-reports>
- [3] C. Shen. *Topological Data Analysis for Medical Imaging and RNA Data Analysis on Tree Spaces*, PhD dissertation, Florida State University (2021).
- [4] T. Hotz, S. Huckemann, H. Le, J. S. Marron, J. C. Mattingly, E. Miller, J. Nolen, M. Owen, V. Patrangenaru. S. Skwerer: Sticky Central Limit Theorems on Open Books. *Annals of Applied Probability*, **23**, 2238–2258 (2013).

5. **Grant funding:** Please describe your present external grant funding situation and list all proposals submitted during the evaluation period. For each proposal, indicate the title, where it was submitted, how you were involved (as P.I. say), and the current status of the proposal.

Grant Proposals

1. Victor Patrangenaru (PI) 5/26/2023 - 5/25/2026, proposal 2311059: *Collaborative Research: Advances in the theory and practice of Non-Euclidean statistics*. Pending at the National Science Foundation.

C. Service Assignment

1. **Departmental committee service:** Please list the departmental committees on which you have served this year.

V. Patrangenaru chairs the Computer Systems and Acquisitions (Tech) Committee (members Adrian Barbu, Jonathan Stewart and James Strichertz). The Tech Committee submitted two proposals: one for RCC computing infrastructure for courses (Stewart and Barbu), and one for

Computers for a Statistics Lab in the Statistics Department (Patrangenaru and Strichertz). Hereby is described Patrangenaru and Strichertz's successful project, that was recently funded, and is currently to underway:

Student Technology Fee Project 2022-2023

To: The Student Technology Fee Advisory Committee

Name of Proposal: Computers for a Statistics Lab in the Statistics Department

Owner / Author: Department of Statistics/ Computer Systems and Acquisitions Committee

College/Division: College of Arts and Sciences

School/Department: Department of Statistics

Email Address: vic@stat.fsu.edu, vpatrangenaru@fsu.edu

Phone Number: xxxxxxxxxx

Proposal Title: Computers for Interactive Learning within a Statistics Lab for in one the tech rooms of the newly renovated Department of Statistics Building

Proposal Description:

Please summarize the purpose of the project. (150 words or less)

We request funds for the department of Statistics to improve and expand the learning with hands-on statistical technological software in an interactive student learning environment, aiming at preparing the student population for a smooth transition from study to a work environment within the 21st century careers market. The primary request is for funds to be allocated for hardware (desktops and monitors) to furnish a statistical computing lab inside one of the existing rooms within the newly renovated Statistics department (Rogers building). This lab will boost the existing Statistical Analysis System (SAS) certificates offered in our department, thus improving the student success after graduation. Thirdly, the lab will be used to improve the examination system in applied and computational classes at both undergraduate and graduate levels, including computational component of the qualifying PhD exams. The lab will help better manage the newly acquired departmental space, for an improved student practical experience.

Category of Proposal:

Classroom and Lab Computers: Lab computers, peripherals for teaching podiums and lecterns, Crestron equipment, Solstice, laptop loaners programs, etc.

Strategic Focus of Proposal:

Hybrid: Project deliverable(s) will include both a significant benefit/service that is not currently available, and will enable an existing benefit or service to continue to be provided, in approximately equal proportions.

Scope of Project:

500 word max

Please describe the scope of the project.

The scope should include details of the deliverable(s), personnel, resources and work needed to reach the goal(s) of the project. The Statistics building was recently renovated following the move of the Oceanography department, from the OSB to the new Earth Sciences building. Following renovation, the third and fourth floor of the former OSB (currently Statistics building) were allocated to the Statistics department. These rooms include office space lecture space, provided with an instructor desktop, overhead projector, screen, etc. No tech resources are available to the students though in the new lecture rooms. The primary goal of the proposal is to enhance the hands on learning resources available to students within the department of Statistics, by obtaining funding to procure desktop computers and peripherals to be readily available resources for students taking courses in such a tech room, that would upgrade it to a Statistics Lab learning environment. Courses offered by instructors in our department, have a sizable statistical computing component, preparing the students for their future applied statistics careers that are in high demand, in the third decade of the 21st century. Therefore personnel and resource requirements to reach the goals of the teaching in a Statistics laboratory are already available within the department, given its strong faculty body, that increased during recent years, given the State of Florida demand for highly educated Statistics and Biostatistics instructors, to lead a younger generation to successful statistics using careers largely available on the marketplace. The resource buy-in requested in this proposal would be available for an indeterminate period, at a very cost effective price. The funding are requested to equip a tech room, such as the lecture room 327, with the necessary hardware and software that would allow a multiple use of this in the setting of a Statistical laboratory. Providing statistical computing skills to students, is critical to our department objective, as it gives our students an edge on an increasingly competitive job market. This project investment follows a low cost, high efficiency model, as well as a hands on interactive teaching with technology lecture and exam room. Such a room, would provide sufficient specific applied and computational statistics

resources, for the benefit of students enrolled in courses within the department that have significant computational components, and in the first place would boost the three SAS certificates offered in our department (see <https://stat.fsu.edu/sas-certificate>), thus helping our graduates on the job market in diverse industries using SAS as their primary software. Our department computer specialist, James Stricherz will be the primary personnel to coordinate the main objective. Applied and computational statistical analysis lectures, and related exams will be delivered on a permanent basis in the lab, which may also be used by students after hours, with appropriate supervisor approval. The lab will help enhance our department successful SAS Certificate program that helps students placement in Statistics related careers in the State of Florida, since SAS is the main statistical software featured for the State of Florida government. Beside SAS, the desktop computers will be equipped with additional statistical software packages, to be used by the instructors in an interactive teaching environment.

Project Timeline:

Please include a timeline for major project activities, including brief task descriptions, target completion dates, and responsibility assignments. The project timeline is as follows:

- 12/15/2022: Funds are transferred upon project being funded.
- 12/16/2022: Begin process to procure the desktop computers and peripherals to equip the SAS lab/teaching with technology at the funded level.

Responsibility assignment: James Stricherz, Computer Specialist, Department of Statistics

- 12/16/2022: Inform faculty within the department of Statistics that the proposal has been funded in order to make them aware of these resources for their classes that could potentially be taught in the Statistics Lab, including but not limited to classes required from students for the SAS Certificate programs. Responsibility assignment Victor Patrangenaru, Professor of Statistics, Fellow of the Institute of Mathematical Statistics.

- 1/6/2023 : End of process to equip the SAS lab/teaching with the hardware at the proposal funded level. Responsibility assignment: James Stricherz, computer specialist, Department of Statistics

- 1/9/2023: The Statistics Lab becomes operational. Responsibility assignment Victor Patrangenaru, Professor of Statistics, Fellow of the Institute of Mathematical Statistics.

Requested Project Amount: \$ 32,761.56.

2. University and SUS committee service: Please list all University and SUS committees, task forces, and governing bodies on which you have served this year.

In 2022 Patrangenaru served as an UFF senator - FSU chapter. Many of the important problems arising at FSU are solved in the UFF senate. These include drafting BOT-UFF CBA for 2022-2025, safety in the workplace for faculty, staff and students, highest raises and bonuses, like the one that was agreed in 2022, etc.

3. International, national, and regional committee service: Please list all international, national, and regional bodies on which you have served this year.

1. Organizer of an invited session at the 5th Conference of the International Society of Nonparametric Statistics, Paphos, Cyprus, June 20 - 24, 2022.

2. Member of the Scientific and Organizing Committee of the 12th *International Conference "Differential Geometry and Dynamical Systems (DGDS 2022)"*, online, August 26–29, 2022.

3. Organizer of an invited session at the AISC 2022 International Conference on Advances in Interdisciplinary Statistics and Combinatorics, October 7 - 9, 2022 The University of North Carolina at Greensboro

4. Office held: Please list all offices in organizations related to your activity as a professional faculty member held by you this year.

4.a. Editorial Board Memberships.

- Journal of Statistical Theory and Practice (since 2022)
- BSG Proceedings, electronic journal (since 2013)
- Differential Geometry - Dynamical Systems, electronic journal (since 2003)
- Applied Sciences (since 2010)

5. Honors received: Please list all professional honors received by you this year.

Dean's Travel Award - Fall 2022. Funding was partially used towards travel to AISC2022 conference in Greensboro, NC.

6. Service to public schools: Please list all activities during the year which can be classed as service to the public schools of Florida. Include such things as judging high school debates, science fairs, brain bowls, performances, fine arts exhibits, commencement addresses, etc.

none in 2022

7. Service to industry: Please list all activities during the year which constituted service to business and industry and which you did not include in your research activities.

. Professional service (see 3.,4. above is included under this category:

A. Reviewer for Refereed Journals

Statistica Sinica-one review in 2022

Electronic Journal of Statistics-one review in 2022

Biometrika- one review in 2022

B. Reviewer for Grant Applications

In 2022 Patrangenaru was a reviewer of a NSERC proposal (Canada).

C. Reviewer for *Mathematical Reviews*, the main publication worldwide that posts reviews of published papers in Mathematical Sciences (including Statistics).

Reviewed MR4316576 (Pending) Cohen, Regev; Elad, Michael; Milanfar, Peyman Regularization by denoising via fixed-point projection (RED-PRO). *SIAM J. Imaging Sci.* 14 (2021), no. 3, 13741406.

D. Curriculum Vitae

AVAILABLE TO PAM AS A SEPARATE ELECTRONIC FILE (cv2023_2_13_patrangenaru.pdf)

E. Summary Statement

In 2022 Vic Patrangenaru's sustained activity to promote advancement of research was internationally recognized. Patrangenaru, an Institute of Mathematical Statistics fellow since 2019, promotes reemphasizing Mathematical Statistics courses in our department graduate programs, including Limit Theory of Statistics and Object Data Analysis, two the most important areas of Statistics, that were overlooked for the wrong reason since 2013 in our graduate program. All the candidates in the recruiting season in 2022 were presenting asymptotic results in statistics and aspects of object data analysis, as they were taught at other fine schools. Our department looks the other way, and does not require such a course; for this reason Patrangenaru feels compelled to provide every other year a course in large sample theory of statistics and object data analysis, so that our Statistics alumni, at least those taking such a course are not statistically illiterates.

Moreover effective 2022 V. Patrangenaru created and funded via the FSU Foundation, two student awards:

1. The **Stela Verenca** award: This is a travel award for students who present talks at a foreign conference in Object Data Analysis related sessions. The award comes with a certificate and a cash prize. (2022 awardee - Adam Dixon)
2. The **Beca Sechter** award: This excellence award will be presented to the top graduate teaching assistants working for Mathematical Statistics-related classes. The award comes with a certificate and a cash prize.

Another important professional activity, was Patrangenaru's refereeing of publication activity.

Here is a thank you note from a IOP Publishing:

[IOP Publishing ;peerreview@iopublishing.org](mailto:peerreview@iopublishing.org), 11/10/2022 Victor Patrangenaru

Your contribution hasn't gone unnoticed Visit iopublishing.org/peer-review — Read this e-mail online — Add us to your safe sender list Peer Review Week at IOP Publishing

NOVEMBER — PEER REVIEW You're one of our 10,000 Trusted Reviewers Thank you Dr Patrangenaru for your ongoing support and peer review excellence.

In 2022, Patrangenaru had excellent students who selected having him as a major professor or adviser.

- **Aaid Alghahtani**, a graduate student from FSU-Statistics, who passed the PhD Essay Exam in 2021, started working on MDS methods for 3D Reflexion Shape in Spring 2020, and on two sample tests for VW antimeans with applications to X-rays analysis. He coauthored a paper at the 2022 DGDS conference with Paige and Patrangenaru A. Alghahtani is a hard working student who has a paper coauthored with Patrangenaru under review, join. He is expected to defend his thesis in Spring 2023.
- **Seunghee Choi**, a graduate student from FSU-Statistics, publicly defended and passed the PhD Exam in 2022. She gave an invited talk at the 2022 AISC Conference in Greensboro, NC, October 2022. She is adding even more details to her dissertation, as she lost certain files, while she had a health scare in 2022. She is expected to be awarded the PhD degree in Spring 2023.
- **Adam Dixon**, a top graduate student from FSU-Statistics, who passed the PhD Qualifying Exam in 2020, started working with Patrangenaru in Spring 2020 on Topological Data Ana-

lysis, has a paper published on this subject, jointly with his major professor and Dr Chen Shen, a former member of our working group. Adam ran a nice nonparametric bootstrap analysis for SARS-Cov2 phylogenetic trees, currently under review, jointly with Patrangenaru and Moore. One of the important ideas in that paper, was to run the analysis on a so called *open book*, for which already existing literature on stratified spaces was very helpful. Adam is an excellent instructor. He was presented the Stela Verenca travel award for a talk given at the ISNPS conference in Paphos, Cyprus, in June 2022.

- **Ka Chun Wong**, joined our working group in 2021, and is currently studying Object Data Analysis. He is interested in projective shape analysis in 3D, and analysis of colored scenes, making nice progress. He is expected to defend his PhD Essay in 2023.
- **Garett Ordway**, is faculty at Pensacola Christian College, and as graduate student at FSU, he joined our working group by the end of 2022. Garett is a top graduate student, interested in Functional Data Analysis and Asymptotic Theory of Statistics.
- **Omar Alharthi**, was a member of Patrangenaru's working group member, who graduated with a Master degree from FSU in 2022, after taking directed research hours with Patrangenaru.

Patrangenaru continues to help graduate students under his supervision **beyond his assigned responsibilities**, as well as his former students, to advance their careers.

An emerging area of modern Statistics, that is due to **V. Patrangenaru** in collaboration with **Leif Ellingson, Daniel Osborne, Rob Paige, J. S. Marron, Ian L. Dryden, R. N. Bhattacharya, Lizhen Lin, Peter Bubenik, S. Huckeman** and to statisticians, scientists, engineers and mathematicians, including **X. Pennec, Baba Vemuri, Anuj Srivastava, Tom Fletcher, John Kent, Jonathan Taylor, Laurent Younes, Hongtu Zhu**, to mention just a few, **Object Data Analysis (aka Analysis of Big Data of Complex Type)**. In 2022, unabated by the difficulties we all experienced, **V. Patrangenaru** worked hard to fulfill his service obligations towards the department and towards the profession to insure that the department will receive a high recognition in the COAS. V. Patrangenaru was active on editorial boards, peer reviewed several papers for various statistics journals, including first and second tier journals. Vic co-organized an invited session at an inter-

national meeting in NC. V. Patrangenaru was deeply entrenched in completing his departmental, university and professional duties.

In 2022 V. Patrangenaru successfully advised four PhD students. One of them defended her dissertation, with a partial success, and another one prepared his PhD essay, participating an international conferences. Vic submitted one new NSF proposal, which is pending, published refereed publication, got one paper accepted subject to a revision, and submitted proceedings paper and two ArXiv publications. Patrangenaru has now 378 citations at Mathematical Reviews, the largest number for an active faculty in our department, and larger than most of the active faculty in the Math department. He joined the researchers having a Google scholar account, to help disseminate knowledge in his research areas. He has currently 2222 citations on Google scholar, including 134 citations in 2022.

In summary, 2022, may qualify as one of the most productive year of V. Patrangenaru as far as teaching, research and service are concerned. Vic's is grateful to those who are recognizing his efforts of teaching, research and service, and in particular to the COAS Dean's office and those sponsoring his 2022 Dean Travel Award.