REPORT DOCUMENTATION PAGE

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14. ABSTRACT

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RPPR Final Report
as of 11-Dec-2018

Agency Code:

Proposal Number: 71532CSCF **Agreement Number: W911NF-17-1-0337**

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DUNS Number: 900060369 EIN:
Report Date: 23-Feb-2018 Date Received: 31-Aug-2018
Final Report for Period Beginning 24-Jul-2017 and Ending 23-Nov-2017
Title: Advanced Computing Workshop
Begin Performance Period: 24-Jul-2017 **End Performance Period:** 23-Nov-2017
Report Term: 0-Other
Submitted By: Ph.D Kalinka Regina Castelo Branco Email: kalinka@icmc.usp.br
Phone: (+55) 163-3738623
Distribution Statement: 1-Approved for public release; distribution is unlimited.

STEM Degrees: **STEM Participants:**

Major Goals: This workshop was aimed at exploring the challenges and innovative solutions regarding Advanced Computing, considering the large data science and analytics, visualization, security, algorithms for future cyber infrastructure, next-gen computing architectures and algorithms, and task specific computing architectures and algorithms.

Accomplishments: Our meeting has stated the connection between US and Brazilian researchers in an exciting environment, where senior scientists, junior scientists, pos-docs and graduate students from a wide range of backgrounds could present their work and share ideas on the future of the Advanced Computing field. Overall, we received many enthusiastic comments about the workshop. Many of the participants were interested in holding this workshop every other year, which must be considered in the future.

Training Opportunities: Nothing to Report

Results Dissemination: The results were disseminated in a prived way. There is a link in the pdf report.

Honors and Awards: Nothing to Report

Protocol Activity Status:

Technology Transfer: Nothing to Report

PARTICIPANTS:

Participant Type: PD/PI
Participant: Kalinka Regina Lucas Jaquie Castelo Branco
Person Months Worked: 1.00 **Funding Support:**
Project Contribution:
International Collaboration:
International Travel:
National Academy Member: N
Other Collaborators:

RPPR Final Report
as of 11-Dec-2018

Participant Type: Co-Investigator
Participant: João Camargo Batista Jr
Person Months Worked: 1.00 **Funding Support:**
Project Contribution:
International Collaboration:
International Travel:
National Academy Member: N
Other Collaborators:

Report on the First Advanced Computing Workshop

1. Introduction

Advanced Computing can be described as the designing and developing of computing, hardware or software, including innovations in designing high-end computing resources (computers, storage, data management, networking and visualization) to help solve highly complex problems.

The environment of humans will continue to evolve to interact with the new advances in computing, and the focus seems to be on exploring advances in computing design, algorithms, and techniques. Emphasizing large data science and analytics, visualization, security, algorithms for future cyber infrastructure, next-gen computing architectures and algorithms, and task specific computing architectures and algorithms can create new challenges to such systems.

This workshop was aimed at exploring the challenges and innovative solutions regarding Advanced Computing, considering the large data science and analytics, visualization, security, algorithms for future cyber infrastructure, next-gen computing architectures and algorithms, and task specific computing architectures and algorithms.

This workshop was held at University of São Paulo located in São Paulo, Brazil. The workshop was from 13th to 14th November 2017. There were invited and contributed talks, besides a round table at the end of the last day. We believe our main goal was achieved by having an exciting meeting where Brazilian scientists had present their work and shared ideas on the future of their research field. In the sequence, we present some technical information about the Army Research Office opportunities in South America, mainly in Brazil.

2. Technical information on the workshop

Organizing Committee:

Kalinka R. L. J. C. Branco – University of São Paulo – Brazil

João Batista Camargo - University of São Paulo – Brazil

Place: Escola Politécnica de São Paulo – University of São Paulo

Dates: from 13th to 14th November 2017

3. Topic subjects:

- Large data science and analytics
- Next-Generation computing architectures and algorithms
    - Architecture, design, implementation and management
    - Vehicular and sensor networks
- Task specific computing architectures, networks, and algorithms.
- Security and algorithms for future cyber infrastructure
    - Security threats to cyber-physical systems
    - Data communication and computer network
- Practical experiences and testbeds
- Industrial experiences and best practices

4. Program

Advanced Computing Workshop (ACW) 2017 – Program 13-November 2017, São Paulo, Brazil	
Welcome	**09:00**
Session 1	**9:15 – 10:25**
Robert Erbacher - Army Research Office (ARO) ***(Keynote Speaker)***	
Coffee Break	**10:30 – 11:00**
Session 2 – Brazilian Team	**11:00 – 12:20**
Kalinka Castelo Branco – ICMC/USP - IoT – UAVs – Security/Safety Researches	
Rodolfo Jardim – UNICAMP - Memory Systems and Processor Microarchitecture	
Paulo Maciel – UFPE - Availability, Reliability and Performance Evaluation	
Lunch Time	**12:30 – 14:00**
Session 3 – Brazilian Team	**14:00 – 15:35**
Anderson Rocha – UNICAMP – DéjàVu - Media Integrity Analytics and Interpretation of Events	
Rivalino Matias - UFU - Dependability of computer systems	
Guido Araújo – UNICAMP - Computer Security and Hardware Acceleration	
Coffee Break	**15:45 – 16:15**
Session 4 – Brazilian Team	**14:00 – 15:35**
Luciano Gaspary – UFRGS - Network “Softwarization”: a new era for networking research	

João Batista Camargo Junior - Poli/USP - Safety and Resilience in Autonomous Systems	
Guilherme Travassos – UFRJ – Experimental Software Engineering	

14-November 2017, São Paulo, Brazil	
Session 5 – Brazilian Team	**9:15 – 10:25**
Luigi Carro – UFRGS – Embedded system transition	
Antonio Frolhlich – UFSC – Towards a Trustful Internet of (Cyber-Physical) Things	
Lucas Wanner – UNICAMP – Using approximate computing to improve energy efficiency	
Coffee Break	**10:30 – 11:00**
Session 6 – Brazilian Team	**11:00 – 12:00**
Avelino Zorzo = PUCRS - Security on IOT and SDN	
Diana Pamela Osorio – UFSCAR - Physical Layer Security for Ultra-Reliable and Low Latency Communications	
Alfredo Goldman – IME/USP - Improving the Quality of Life in Cities with Computer Science	
Session 7 – USA Team	**12:00 – 12:30**
James Ross – ARL – An OpenSHMEM Implementation for the Adpteva Epiphany Coprocessor	
Session 8 – Brazilian Team	**12:30 – 13:00**
Hermes Senger – UFSCAR – Research Interests - UFSCAR	

Lunch Time	**13:00 – 14:00**
Session 9 – Brazilian Team	**14:00 – 15:15**
Alisson Brito – UFPB - Development of a Platform for Distributed Simulation and Design of Complex and Heterogeneous Embedded Systems	
Roberto Santos Inoue – UFSCAR – Markovian Jump Linear Systems-based filtering for Visual and GPS Aided Inertial Naviation System	
André Ponce Carvalho – ICMC/USP - Machine Learning Future Challenges	
Alex Pinto – UFSC -	
Session 10 – Round Table	**15:15 – 16:15**
Session where new names proposal, topics ideas, and future plans	
Coffee Break	**16:15 – 16:45**
Wrap up - Closing Session	**16:45 – 18:00**

5. Participating Communities

The workshop was planned to attracts researchers and practitioners from communities working on advanced computing involving large data science and analytics, visualization, security, algorithms for future cyber infrastructure, next-generation computing architectures and algorithms, and task specific computing architectures and algorithms. We attracted 50 participants in the two days workshop. The list of invited researches and the respective research area can be seen in the Table 1.

Table 1 – Invited Researchers and Research Areas

Name	Area/Expertise	University	State
Alex Sandro Roschildit Pinto	Embedded	UFSC	SC
Alfredo Goldman	Networks/HPC/Smart cities	IME – USP	SP
Alisson Brito	Embedded	UFPB	PB
Anderson de Rezende Rocha	Machine Intelligence, Data Analysis and Forensics	UNICAMP	SP
André Ponce Carvalho	Deep Learning	ICMC	SP
Antonio Augusto Frohlich	Embedded / IoT	UFSC	SC
Avelino Zorzo	Network Sercurity	PUC-RS	RS
Daniel Fernando Pigatto	Network security - UAV - IoT	UTFPR	PR
Diana Pamela Osorio	Wireless Communication Networks	UFSCAR	SP
Fabio Kon	Smart Cities	IME-USP	SP
Guido Araujo	Architecture/Compilers/Parallelism	Unicamp	SP
Guilherme Horta Travassos	Software Quality, Risk Analysis	UFRJ	RJ
Hermes Senger	Network Security	UFSCAR	SP
João Batista Camargo Jr	Embedded Systems – UAV	POLI-USP	SP
Jorge Rady	Embedded Systems	USP	SP
Kalinka Castelo Branco	Network security – IoT- UAV	USP	SP
Lucas Wanner	Embedded	Unicamp	SP
Luciano Gaspary	Networks	UFRGS	RS
Luigi Carro	Embedded	UFRGS	RS
Luiz Henrique Castelo Branco	Network security - UAV - IoT	IFSP	SP
Paulo Romero Martins Maciel	Dependability	UFPE	PE
Paulo Sérgio Cugnasca	Embedded Systems	USP	SP
Rivalino Matias	Data Analytics in Sw Reliability & Performability	UFU	MG
Roberto Santos Inoue	Robotics - UAV - Control system - Filtering - Visual SLAM	UFSCAR	SP
Rodolfo Azevedo	Architecture	Unicamp	SP
Rosana T. Vaccare Braga	Software Engineering	USP	SP
Valter Vieira de Camargo	Software Modernization - Adaptive Systems - Energy-Aware softw	UFSCar	SP

The invited researchers are from the whole Brazil states, from the north to the south as can be seen in the map illustrated in Figure 1.

Figure 1 – Map illustrating the researchers from different states in Brazil.

James Ross, from Army Research Laboratory (ARL) gave a presentation in the second day of the workshop. This was the only EUA player in the whole workshop. This was one of the issues that we have. The bureaucracy to bring ARL researchers made impossible a more close relationship between USA and Brazil then we thought in the beginning. For the next edition of the workshop we need to plan in advance the invitation to the American researchers and we need a better pre-preparation of the researchers from ARL for the schedule to come to Brazil.

All sections were transmitted alive and a registration was made in Youtube® and can be find in https://www.youtube.com/watch?v=pMNjBRqQP2c&feature=youtu.be. (for the first day) and https://www.youtube.com/watch?v=AH9kDkHgDAo (for the second day). There are available two versions of the stream (the original one and the noise cancelation version). All the slides and pointer information to the beginning time

for each speech are also available, as can be seen in Figure 2. All of the information of the ACW is available for the one that have the link.

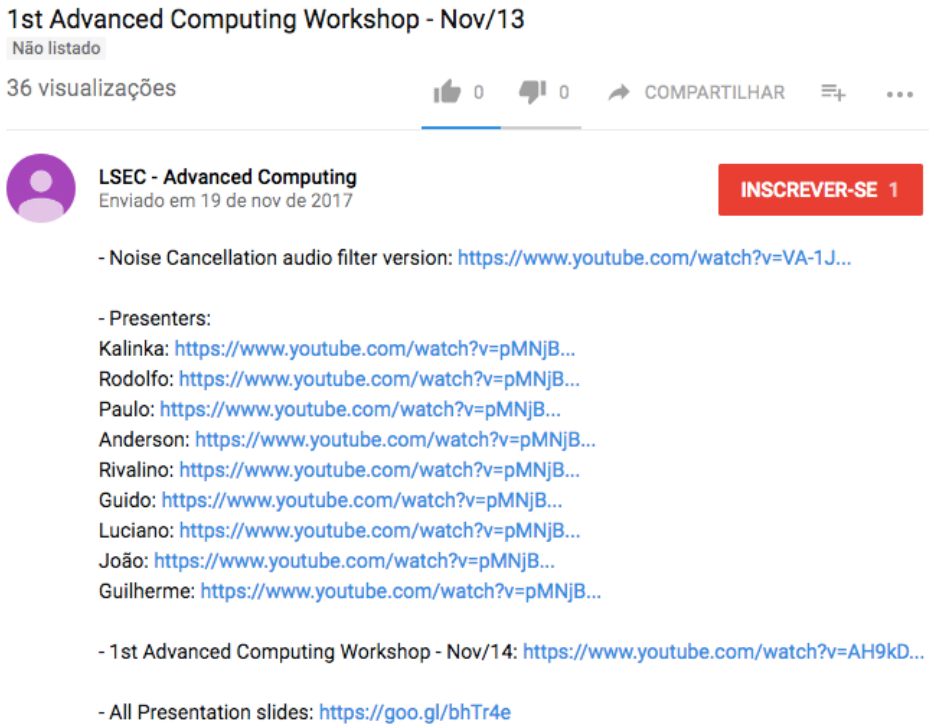

Figure 2 – Example of the information in Youtube link.

Another important achievement of ACW for ARO is the survey conducted during and after the workshop. The questions of the survey are summarized in Table 2. The Form can be seen in Appendix A. The survey is not complete yet, but the initial results can be seen in the Appendix B.

The results obtained by the survey will be very important and strategic for ARO, perspectives of funding and budget can be estimated. A better match between the Brazilian and US researchers can be done.

Table 2 – Survey question applied in the ACW attendants.

Question	Answer
E-mail Address	
Name	
Research Expertise	
Personal WebPage	
1. Are you planning to submit a proposal to ARO?	Yes/No
2. Will this be a solo or group project?	Solo/Group
3. Estimate Budget?	Maximum 50K
4. Will the project have a US Collaborator?	Yes/No
5. Are you interested in participatin in ARL Open Campus?	Yes/No
6. Is you answer Yes in the previous question, is funding through a fellowship required?	Yes/No
7. How long woulf you want to visit for?	2 weeks?
8. Do you expect to have undergraduate students apply for an ARL fellowship?	Yes/No
9. Do you expect to have undergraduate students apply for an ARL fellowship?	Yes/No
10. Do you have soon to be postdocs that you expect to apply for an ARL fellowship?	Yes/No
11. Do you expect spend time at ARL?	Yes/No
12. If you answer yes in the previous question, how long (in weeks)?	1/ 2/ 3/ 4/ more than 4
13. Do you expect to have students that will want to spend time at ARL without an ARL fellowship?	Yes/No
14. What is the most likely timeframe for students to visit?	US Summer/Brazilian Summer/Other/LongerPeriod

6. Final comments

Advanced computing is an expansive term and can't be specifically linked to a one definition. High performance computing can be one of the meanings, where computer clusters function as a supercomputer. Application and usage of term "advanced computing" can be extremely diverse depending upon the environment, would teach a broader range of skills, and would go into more depth with each.

Computing can provide solutions to society's greatest challenges and systems help us use data to improve the way the world works. From smartphones and drones to transport networks, smart cities and the Internet of Things, most innovations need new ideas and a joint collaboration to be solved.

In this spirit, the main topics that were addressed at the workshop were:

- Large data science and analytics, including visualization;
- Next-generation computing architectures and algorithms;
- Task specific computing architectures, networks, and algorithms;
- Security and algorithms for future cyber infrastructure;
- Smart Cities;
- Software Defined Network;

- Internet of Things;
- Unmanned Vehicles.

Our meeting has stated the connection between US and Brazilian researchers in a exciting environment, where senior scientists, junior scientists, pos-docs and graduate students from a wide range of backgrounds could present their work and share ideas on the future of the Advanced Computing field. Overall, we received many enthusiastic comments about the workshop. Many of the participants were interested in holding this workshop every other year, which must be considered in the future. Is expected that the next edition of the workshop count with paper submission from joint partners (Brazilian and US researchers). The workshop was extremely successful for exchanging scientific ideas, start the collaboration process and spread the U.S. Army Research Lab initiative to provide support and funding on the topic of Advanced Computing in South America.

Appendix A

SURVEY - ARO

Survey com respostas para o Army Research Office.

*Obrigatório

1. **Endereço de e-mail** *

2. **Name** *

3. **Research Expertise** *

4. **Personal Web Page** *

5. **1. Are you planning to submit a proposal to ARO?** *
   Marcar apenas uma oval.
   - YES
   - No

6. **2. Will this be a solo or group project?** *
   Marcar apenas uma oval.
   - Solo
   - Group

7. **3. Estimated Budget? 50K** *

8. **4. Will the project have a US Collaborator?** *
   Marcar apenas uma oval.
   - Yes
   - No

9. **5. Are you interested in participating in ARL Open Campus?** *
Marcar apenas uma oval.

- Yes
- No

10. **6. If you answer yes in the previous question, is funding through a fellowship required?**
Marcar apenas uma oval.

- Yes
- No

11. **7. How long would you want to visit for? 2 weeks**

_____

12. **8. Do you expect to have undergraduate students apply for an ARL fellowships?** *
Marcar apenas uma oval.

- Yes
- No

13. **9. Do you expect to have undergraduate students apply for an ARL fellowships?** *
Marcar apenas uma oval.

- Yes
- No

14. **10. Do you have soon to be postdocs that you expect to apply for an ARL fellowships?** *
Marcar apenas uma oval.

- Yes
- No

15. **11. Do you expect spend time at ARL?** *
Marcar apenas uma oval.

- Yes
- No

16. **12. If you answer yes in the previous question, how long (in weeks)?**
Marcar apenas uma oval.

- 1 week
- 2 weeks
- 3 weeks
- 4 weeks
- More than 4 weeks

17. **12. Do you expect to have students that wil want to spend time at ARL without an ARL fellowship?** *

Marcar apenas uma oval.

- Yes
- No

18. **11. What is the most likely timeframe for students to visit?** *

Marcar apenas uma oval.

- US Summer
- Brazilian Summer
- Other/Longer Period

Uma cópia das suas respostas será enviada para o endereço de e-mail fornecido

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Google Forms

Appendix B

SURVEY - ARO

16 respostas

Name

16 respostas

Luciano Paschoal Gaspary (INF/UFRGS)

Anderson

Avelino Francisco Zorzo

João Batista

carro@inf.ufrgs.br

Andre C P L F de Carvalho

Antônio Augusto Fröhlich

Hermes Senger

Rivalino Matias Jr.

Daniel Fernando Pigatto

Guilherme Travassos

Roberto Santos Inoue

Diana Pamela Moya Osorio

Alex Sandro Roschildt Pinto

Rodolfo Jardim de Azevedo

Alfredo Goldman

Research Expertise

16 respostas

Computer Networks & Cybersecurity

Machine Learning; Machine Intelligence; Digital Forensics

Dependability and Security

Safety and Dependability

carro@inf.ufrgs.br

Machine learning

Embedded Systems, WSN, IoT

Parallel computing, BigData

Analytics Applied to Software Reliability

Computer Networks, Security, IoT

Experimental Software Engineering; Verification, Validation and Testing

Robotics, control, filtering, intelligent systems

Wireless Communications/5G

wireless networks

Computer Architecture

Distributed Systems

Personal Web Page

16 respostas

http://www.inf.ufrgs.br/~paschoal

http://www.ic.unicamp.br/~rocha

www.inf.pucrs.br/zorzo

http://www.gas.pcs.poli.usp.br/

carro@inf.ufrgs.br

http://www.cemeai.icmc.usp.br/andre

http://lisha.ufsc.br/ http://iot.ufsc.br/

http://www.dc.ufscar.br/~hermes/

http://www.portal.facom.ufu.br/node/23

http://paginapessoal.utfpr.edu.br/pigatto

http://www.cos.ufrj.br/~ght

http://www.robotica.ufscar.br/~roberto/

http://lattes.cnpq.br/5374423182568583

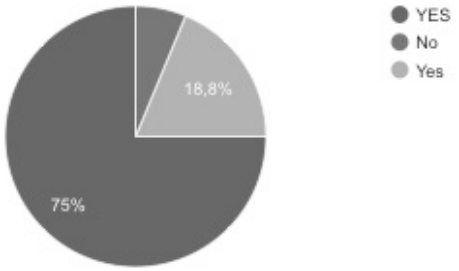
blumenau.ufsc.br

http://www.ic.unicamp.br/~rodolfo

www.ime.usp.br/~gold

1. Are you planning to submit a proposal to ARO?

16 respostas



2. Will this be a solo or group project?

16 respostas

3. Estimated Budget? 50K

16 respostas

50K (6)

Not sure, probably budget for 2 PIs.

Initially 50k USD / year

Not this time

US$ 50.000,00

50k

~50K

50K per researcher

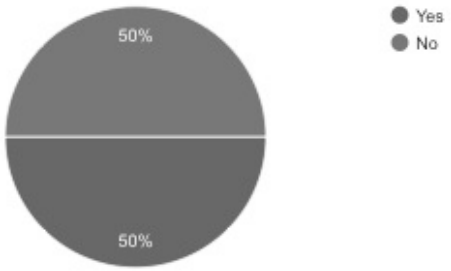
50000

50 K

I do not have an exact idea yet

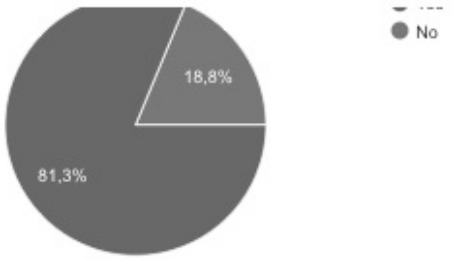
4. Will the project have a US Collaborator?

16 respostas



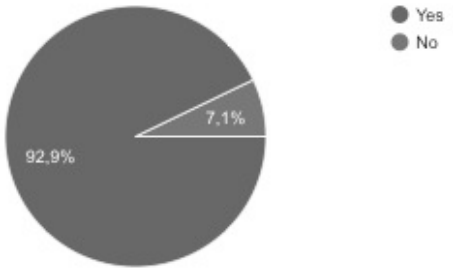
5. Are you interested in participating in ARL Open Campus?

16 respostas



6. If you answer yes in the previous question, is funding through a fellowship required?

14 respostas

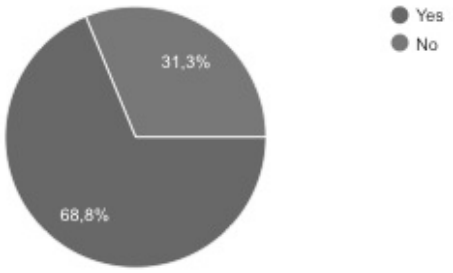


7. How long would you want to visit for? 2 weeks

14 respostas

8. Do you expect to have undergraduate students apply for an ARL fellowships?

16 respostas



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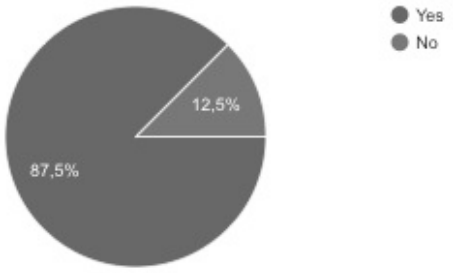
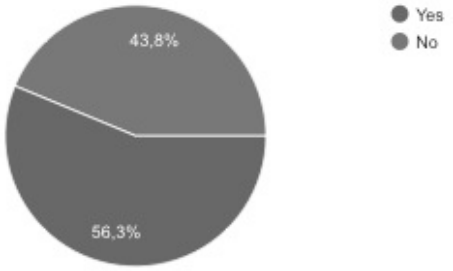
16 respostas



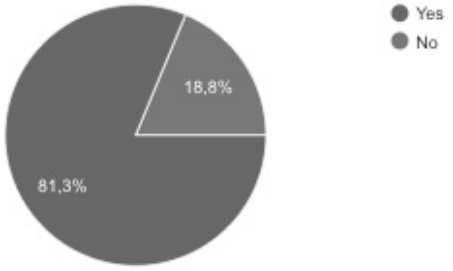
10. Do you have soon to be postdocs that you expect to apply for an ARL fellowships?

16 respostas



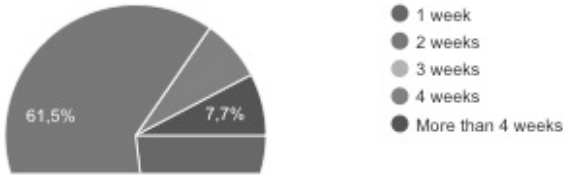
11. Do you expect spend time at ARL?

16 respostas



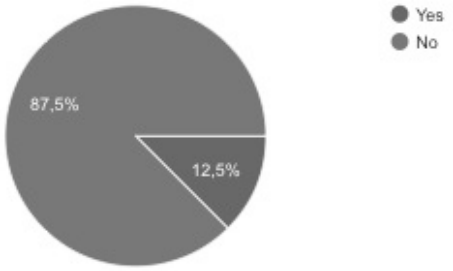
12. If you answer yes in the previous question, how long (in weeks)?

13 respostas



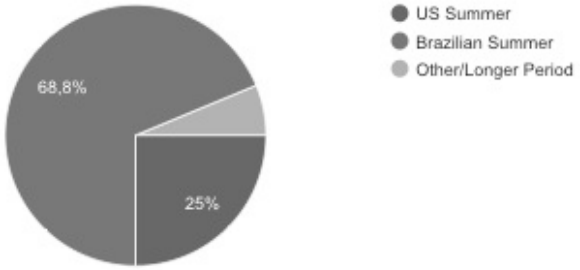
12. Do you expect to have students that wil want to spend time at ARL without an ARL fellowship?

16 respostas



11. What is the most likely timeframe for students to visit?

16 respostas



Número de respostas diárias

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