Anton Bobkov

Contact Information

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Phone: (408)813-6331

Teaching Philosophy

When I teach my priority is to let the students develop a deep connection to the material that they can carry outside of the classroom. I achieve this by empasizing interaction with the material and effective ways of communicating the material. I make sure to incorporate demostrations and interactive activities in my teaching when possible. I also rely heavily on visual aid and online tools for communicating mathematical ideas. I relate the material to its real world applications to empasize its importance and to present it as a part of a bigger picture. When working with students individually, I encourage independent work and exploration while providing concrete tasks and goals.

Honors and Awards

2016 Departmental Teaching Award
Award given to Teaching Assistants in the mathematics department with excellent teaching records.

Teaching Experience

Instructor **2016 - 2017**

- Math 31B: Integration and Infinite Series
- Math 32BH: Calculus of Several Variables (Honors)

Teacher Assistant **2012 - 2017**

- Math 31B: Integration and Infinite Series
- Math 33A: Linear Algebra and Applications
- PIC 10B: Intermediate Programming
- PIC 20A: Principles of Java Language with Applications
- PIC 40A: Introduction to Programming for Internet
- Math 115B: Linear Algebra
- Math 174E: Mathematics of Finance

Undergraduate Projects Mentor **2016 - 2017**

- Conway's game of life variations with C++/SDL graphics library
- App development platform with Typescript 2
- Internet browsing data/trends visualization with Python
- Optical character recognition via neural nets with Python
- Discrete signal processing with Matlab

ALSO INCLUDED

Student Evaluations

- Math 33A: Linear Algebra and Applications
- PIC 10B: Intermediate Programming
- Math 31B: Integration and Infinite Series

Practice Problems A set of practice problems for the first midterm in Math 31B: Integration and Infinite Series.

Midterm The first midterm for Math 31B: Integration and Infinite Series.

Worksheets Two in-class assignments for Math 115B: Linear Algebra and PIC 10B: Intermediate Programming.

Research Project Summary Final report summarizing an independent project involving Conway's game of life variations.

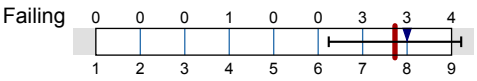
A.A. BOBKOV
Evaluation of Instruction Program Report

13W: MATH 33A DIS 1C: LINEAR ALGBRA&APPLS
No. of responses = 11
Enrollment = 37
Response Rate = 29.73%

Survey Results

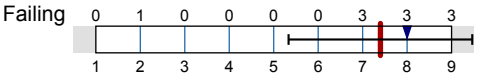
1. UCLA Department of Mathematics:

1.1) How would you rate your TA as an effective teacher?



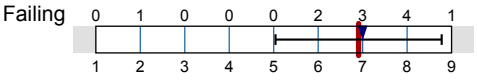
n=11
av.=7.73
md=8
dev.=1.49

1.2) How would you rate the availability and helpfulness of your TA outside of the classroom?



n=10
av.=7.4
md=8
dev.=2.07
ab.=1

1.3) What is your rating of this course independent of the effectiveness of the TA?



n=11
av.=6.91
md=7
dev.=1.87

Profile

Subunit: MATH
Name of the instructor: A.A. BOBKOV
Name of the course: (Name of the survey) 13W: MATH 33A DIS 1C: LINEAR ALGBRA&APPLS

Values used in the profile line: Mean

1. UCLA Department of Mathematics:

1.1)	How would you rate your TA as an effective teacher?	Failing		Excellent	n=11 av.=7.73
1.2)	How would you rate the availability and helpfulness of your TA outside of the classroom?	Failing		Excellent	n=10 av.=7.40
1.3)	What is your rating of this course independent of the effectiveness of the TA?	Failing		Excellent	n=11 av.=6.91

Comments Report

2. Comments:

2.1) Please use the space provided for any comments you wish to make which are pertinent to the educational process. These may include all aspects of the course: teaching, examinations, grading, textbook, etc.

- A good, straight-forward TA.
- Anton knows his material and how to convey his points well. Mandatory quizzes aside, I thought discussions were worthwhile and organized and I benefited from Anton's TA'ing.

  Definitely a solid TA that I would be happy to have in any future math course.
- Anton was a truly outstanding TA. He was extremely knowledgeable about every topic covered in the course and often provided a prospective that was much easier for me to learn from than that which was presented in lecture.
- Effective teaching style.
- Great TA. Very knowledgeable.
- Have more time for questions at the end of the discussion.
- He was a really fantastic TA. I felt like anything that was unclear from the instructor was cleared up during the class discussion (and sometimes that was a lot!). He had the ability to teach us an entire week's worth of information in just 30-40 minutes. He would make a very patient and effective teacher. I went to at least half of his office hours and he was always so helpful. His teaching is a large part of my success in the course.
- The warm up problems at the beginning of the discussion were a great indication of how well one was doing in the class. Keep those up. Going over the quiz problems right after also helped. Overall you did great work answering many of the questions students brought up

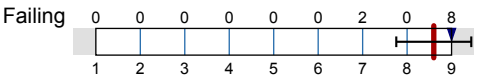
A.A. BOBKOV
Evaluation of Instruction Program Report

15W: COMPTNG 10B DIS 1A: INTRMDT PROGRAMMING
No. of responses = 10
Enrollment = 24
Response Rate = 41.67%

Survey Results

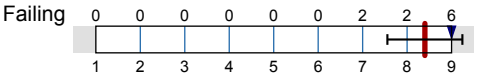
1. UCLA Department of Mathematics:

1.1) How would you rate your TA as an effective teacher?



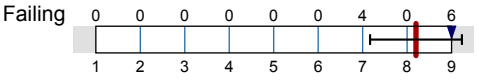
n=10
av.=8.6
md=9
dev.=0.84

1.2) How would you rate the availability and helpfulness of your TA outside of the classroom?



n=10
av.=8.4
md=9
dev.=0.84

1.3) What is your rating of this course independent of the effectiveness of the TA?



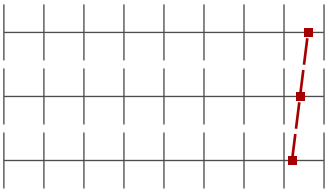
n=10
av.=8.2
md=9
dev.=1.03

Profile

Subunit: MATH
Name of the instructor: A.A. BOBKOV
Name of the course: (Name of the survey) 15W: COMPTNG 10B DIS 1A: INTRMDT PROGRAMMING

Values used in the profile line: Mean

1. UCLA Department of Mathematics:

1.1)	How would you rate your TA as an effective teacher?	Failing		Excellent	n=10 av.=8.60
1.2)	How would you rate the availability and helpfulness of your TA outside of the classroom?	Failing		Excellent	n=10 av.=8.40
1.3)	What is your rating of this course independent of the effectiveness of the TA?	Failing		Excellent	n=10 av.=8.20

Comments Report

2. Comments:

2.1) Please use the space provided for any comments you wish to make which are pertinent to the educational process. These may include all aspects of the course: teaching, examinations, grading, textbook, etc.

- Anton clearly knows about C++, so there shouldn't be any worries about having a TA who will not help you at all.

  At times, his methods of solving will be different than that of the professor, but I see that more as the nature of C++ (much like in math, there's more than one way of solving a problem) than an indictment of him.

  Not much else to say, other than going to discussion will help expand on the lectures and ensure that you understand how concepts such as inheritance, linked lists, etc. work.

- Anton is a really helpful TA! He's very clear when explaining and when demonstrating how something works. He's easily one of the better TA's in PIC courses. :)

- Anton is one of the most amazing TA's that I've had. I thought my TA for PIC 10A was good, but Anton proved to be even better.

  I like the way he structured his discussion sections and the way he ran office hours. He was always helpful and clear. I even thought that sometimes he was more clear with explaining than the professor.

- He's really good and he helps us understand homework and material a lot.

- One of the most effective TA's I have had in the math department. He posts useful information from each discussion on the course website and provides useful exercises during each class that test the understanding of concepts.

- he's the best PIC TA there is! I could not have asked for a better TA

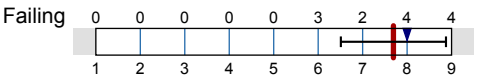
A.A. BOBKOV
Evaluation of Instruction Program Report

13W: MATH 31B DIS 1B: INTEGRTN&INF SERIES
No. of responses = 13
Enrollment = 35
Response Rate = 37.14%

Survey Results

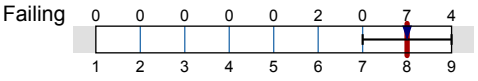
1. UCLA Department of Mathematics:

1.1) How would you rate your TA as an effective teacher?



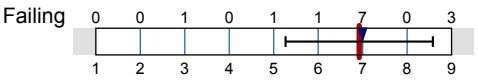
n=13
av.=7.69
md=8
dev.=1.18

1.2) How would you rate the availability and helpfulness of your TA outside of the classroom?



n=13
av.=8
md=8
dev.=1

1.3) What is your rating of this course independent of the effectiveness of the TA?



n=13
av.=6.92
md=7
dev.=1.66

Profile

Subunit: MATH
Name of the instructor: A.A. BOBKOV
Name of the course: (Name of the survey) 13W: MATH 31B DIS 1B: INTEGRTN&INF SERIES

Values used in the profile line: Mean

1. UCLA Department of Mathematics:

1.1)	How would you rate your TA as an effective teacher?	Failing		Excellent	n=13 av.=7.69
1.2)	How would you rate the availability and helpfulness of your TA outside of the classroom?	Failing		Excellent	n=13 av.=8.00
1.3)	What is your rating of this course independent of the effectiveness of the TA?	Failing		Excellent	n=13 av.=6.92

Comments Report

2. Comments:

2.1) Please use the space provided for any comments you wish to make which are pertinent to the educational process. These may include all aspects of the course: teaching, examinations, grading, textbook, etc.

- Anton always opens up extra office hours during exam weeks and is willing to go over difficult problems in discussion. He also comes to discussion prepared to summarize what the Prof went over during the week and often previews what we will learn in the following lectures.
- Anton was a wonderful T.A. the whole quarter. Seemed to always pick the right examples to test our knowledge.
- He was very very organized during the discussion and went over all the main points we needed to know for each section. He is also exceptionally friendly and approachable in that as a student i always felt comfortable enough to seek help.
- He's a really concern and nice TA. Whenever I had questions he could solve them immediately and he made a lot of sense in the class. The revision he gave regarding the lecture was helpful and I hope I will have the chance to take his other math sections.
- I would actually say this guy did a pretty good job.

Number of people in the group: _____

Work on the following problems in groups. This worksheet will be collected at the end (but it will not be graded).

Write down the answer for each problem that you finish. For problems involving convergence or divergence of infinite series also write down the tests that you were using to get the answer.

1. For each of the following series, **evaluate it** or show that it diverges.

$$\frac{6}{2^0} + \frac{6}{2^1} + \frac{6}{2^2} + \frac{6}{2^3} + \cdots$$

$$\sum_{n=1}^{\infty} \frac{5 + (-2)^n}{3^n}$$

2. Compute Taylor polynomial $T_n(x)$ for e^x centered at -1.

3. Consider Taylor polynomial $T_3(x)$ for $\sin(3x)$ centered at 0. Compute error bound for

$$|T_3(.1) - \sin(.3)|$$

4. Compute interval of convergence for each of the following power series:

$$\sum_{n=1}^{\infty} \frac{x^n}{n^2} \qquad\qquad \sum_{n=1}^{\infty} \frac{3^n(x-1)^n}{n}$$

5. Starting from Maclaurin series written on the whiteboard, derive Maclaurin series for the following functions. Also specify for which x the expansion is valid.

$$\sin(x^2) \qquad\qquad \frac{1}{(1-3x)^2}$$

6. For each of the following series, determine whether it converges or diverges.

$$\sum_{n=1}^{\infty}\left(\frac{n}{2n+1}\right)^n \qquad\qquad \sum_{n=3}^{\infty}\frac{\ln n}{n^3+1}$$

$$\sum_{n=1}^{\infty}\cos\left(\frac{1}{n}\right) \qquad\qquad \sum_{n=2}^{\infty}\frac{n!}{2^n}$$

7. For each of the following series, determine whether it diverges, converges conditionally, or converges absolutely.

$$\sum_{n=2}^{\infty}\frac{(-1)^n}{n^2+n} \qquad\qquad \sum_{n=1}^{\infty}\frac{(-1)^n}{\ln(n)+2}$$

Math 31B
Summer C 2016
Midterm 2
August 29, 2016
Time: 9:00 AM to 10:00 AM

Last Name (Print): _____

First Name (Print): _____

Student ID: _____

Do not open the exam until instructed to do so.

Enter all requested information on the top of this page.

This exam contains 6 pages (including this cover page) and 5 problems.

You may *not* use your books, notes, or any calculator on this exam.

You are required to show your work on each problem on this exam.

- **When you use a convergence test you must indicate this** and show how the conditions for the test are satisfied.
- **Organize your work**, in a reasonably neat and coherent way, in the space provided. Work scattered all over the page without a clear ordering will receive very little credit. **Please box your final answers.**
- **Mysterious or unsupported answers will not receive full credit**. A correct answer, unsupported by calculations, explanation, or algebraic work will receive no credit; an incorrect answer supported by substantially correct calculations and explanations might still receive partial credit.
- If you need more space, use the back of the pages; **clearly indicate when you have done this**.

Do not write in the table to the right.

Manage your time well! If you get stuck on a problem, try working on something else and come back to it later.

Problem	Points	Score
1	20	
2	20	
3	15	
4	20	
5	25	
Total:	100	

1. For each of the following series, **evaluate it** using the formula for the sum of geometric series or show that it diverges.

   (a) (10 points)

$$\frac{1}{2} - \frac{1}{2^2} + \frac{1}{2^3} - \frac{1}{2^4} + \cdots$$

   (b) (10 points)

$$\sum_{n=2}^{\infty} e^n$$

2. (a) (10 points) Compute the third degree Taylor polynomial $T_3(x)$ for $\ln(x)$ centered at 1.

(b) (10 points) Compute error bound for

$$|T_3(1.3) - \ln(1.3)|$$

3. (15 points) Starting from Maclaurin series

$$\frac{1}{1-x} = 1 + x + x^2 + x^3 + \cdots = \sum_{n=0}^{\infty} x^n$$

derive Maclaurin series for the following function:

$$\frac{1}{(1-x^2)^2}$$

(you do *not* need to specify for which x the expansion is valid).

4. (20 points) Compute the interval of convergence for the following power series:

$$\sum_{n=1}^{\infty} \frac{(x-1)^n}{n(-2)^n}$$

5. For each of the following series, determine whether it converges or diverges:

(a) (8 points)

$$\sum_{n=1}^{\infty} \sqrt{1+\frac{1}{n^2}}$$

(b) (8 points)

$$\sum_{n=2}^{\infty} \frac{\ln(n)+n^2}{n^3-5}$$

(c) (9 points)

$$\sum_{n=1}^{\infty} \frac{\sin n}{n^2}$$

Consider the matrix A

$$\begin{bmatrix} 0 & 0 & 8 \\ 1 & 0 & 0 \\ 0 & 1 & 0 \end{bmatrix}$$

over real numbers.

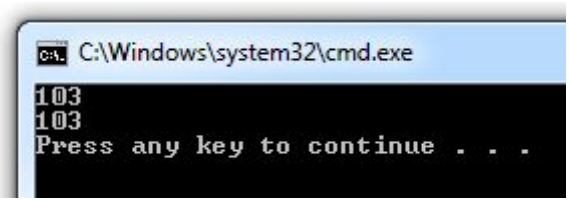
(1) Compute its characteristic polynomial, and factor it as much as possible. (Remember that we are over reals)
(2) Find an eigenvector v_1
(3) Find a vector in the kernel of $A^2 + 2A + 4$, and call it v_2.
(4) Write matrix A with respect to basis v_1, v_2, Av_2
(5) Now work over complex numbers. Find an eigenbasis and use it to diagonalize the matrix.

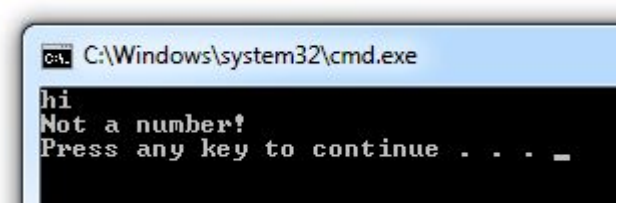
In lecture 4 Pr. Ouellette gave the following function as an example

```
bool readDigit(int& digit)
{
	char c;
	cin.get(c); // read as char into c

	// if char c is in fact a digit
	if(c >= '0' && c <= '9')
	{
		cin.unget();	// put c's data back into cin
		cin >> digit;	// read as an int instead
		return true;
	}
	else
		return false;
}
```

Use this function to write the following program. User enters some input. If it is a number, output that number. If not, output "Not a number!".





(write code below)

```
int n;
bool success = readDigit(n);
if(success)
	cout << n << endl;
else
	cout << "Not a number!" << endl;
```

(It was pointed out to me that if you enter "12hi", the program will output "12", whereas one might expect it to output "Not a number". So I guess there is some ambiguity here but the important part is that you understand how this function works.)

Guoan Wang 004268976
Xi Lin 404326451

Math 99 Summary

Our project focuses on the variation of Conway's Game Of Life (hereinafter to be referred as Game). It is a cellular automation that can be a simulation of a certain community or ecosystem. Specifically, we tried to use the Game model to simulate the predator-prey model with two or three species.

First, we implemented the basic Game with only one species. Under the direction of Anton Bobkov, we implemented the Game on C++ and visualized it by using the SDL2.0 Library. We use a two-dimensional array to store all the information of the cells on the plane, including its current living state, the position of its neighbors and so on. We constructed an interface with a rectangle board representing the ecosystem, and several functional buttons such as pause, resume, restart, clear the board, and quit (and these could also be done by the pressing on the keyboard). The Game can run automatically because we use the SDL Timer; when the user pauses the game, he can change the living state of an individual cell by mouse click. We also construct other windows to update the time-population graph and phase graph (for multiple species). To accomplish all the functions mentioned above, we learned the SDL Poll Event function and function pointers.

In addition, we implemented some variations of the Game. The most common one is named S23/B3 (Survive only if 2 or 3 neighbors, born only if 3 neighbors). We tried S23/B36 (highlife) and S1357/B1357 and S2468/B2468 (replicators).

For the predator-prey model with two species, we tried many different life rules. The basic logic behind the scene is that a predator will die if there are not enough preys around it; a prey will die if it is alone (since herbivores usually live in group) or there is any predator around it; the preys are very productive while the predators will be able to give birth only if there is one additional unit of food around them. When we plot the time-population graph of both species, it turns out that if both of them could survive, the populations of both of them will be oscillating within a certain range with the population of predators trailing that of prey by 90° in the cycle.

This reminds us of the Lotka-Volterra equations ($dx/dt = \alpha x - \beta xy$, $dy/dt = \delta x\gamma - \gamma y$). We guess that some relations between our simulation and the Lotka-Volterra equations could be found by figuring out the parameters. We took Anton Bobkov's

suggestion that once we save all the population data in the simulation, we can do linear regression to get the value of these parameters. After we do linear regressions on x, xy, and y, the parameters turn out to be statistically significant (with p value less than 0.001). However, these parameters will vary with different initial configuration; in other words, each time we start a new simulation, the parameters will also be different. Furthermore, the adjusted R-square value is only about 0.6. In fact, if we do linear regression on more variables such as x^2, y^2, x^2y, xy^2, the adjusted R-square will be much larger. Therefore, although the population of both species can explain our model in some extent, the influence from the actual configuration is not negligible.

Furthermore, we expand our model to the three-species model. We have two variations of that. The first one is the "rock-paper-scissors" one, in which A→B→C→A (the arrow represents energy flow, e.g. x→y means x is eaten by y). This model also turns out to be stable: after a period of time, the population of the three species will become periodic. From the ecosystem board we can observe a infinite spiral loop of three colors. The second one is an extension of the two-species model, in which C→B→A (i.e. A is the dominant species, B is the middle one, and C is the bottom one). We modified the life rules by adding a factor that represents an individual's tolerance to danger and starvation. This time, we plot the time graph a little differently: we plot A and B the same as before, but we reflect the population of C over the x-axis (as if we are plotting the negative value of the population C). The three lines look pretty much alike in shape, and one is imitating the behavior of another.