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1 Lecture 16.01.2020

- scientific approach: trying to solve a new problem with an old method, an old problem with a new method – but not solving a new problem with a new method
- abstracts are very important because that is often all that people see
- since 2002 the most important thing in academic writing is the number of citations a paper receives
- web of Science is a citation counting system

- *Impact Factor* is a measure of how much a publication/journal matters
- papers are dense and have previously unknown research
- length of 4 to 40 pages – have all the normal/expected sections
- letters are usually shorter, much denser, of high importance – 4 pages
- bookends reference miner and reference management software
- impact factor and citations are first order approximations of the quality of a paper
- some good journals: Nature, Science, PNAS, Nature Communications, SIAM Review, Physical Review Letters, Nature Physics, Nonlinearity, Communications in Mathematical Physics, Physical Review E, IEEE Transactions on Pattern Analysis and Machine Intelligence. . .
- reviews/monographs: comprehensive and organized collection and synthesis of a new body of knowledge – someone goes through many papers and writes something about the state of the field or something
- review can be by many authors, monograph only has one author
- **write a paper about the solving of quadratic equations according to the principles outlined in the Read_applied.pdf p. 12**

2 Lecture 21.01.2020

2.1 Homework

2.1.1 Working group session 2

1. Concise
 - What is the topic of the paper? – Analyzing patterns in human speech in 6 European languages, with 4h of material per language in different situations and 16000 hertz, 2 bit sampling
 - How many key messages does the paper have? – Two
 - What are they? – The energy distribution follows a power law and is very similar between languages; The interevent timings between languages (their histograms) also mostly follow a power law and converge for short timings
 - Are they relevant? – they seem to be relevant for speech synthesis and understanding what speech and how it works, maybe shared human characteristics; there does not seem to be chaos at the root of human speech
2. Highlight and contextualize
 - Summary of key results in title and abstract? – Yes, even though I would question the “universality” part of the title
 - Contextualize results in introduction? – Yes, maybe a bit too much, they mention everything from earthquakes to stochastic noise and fractals
 - Introduction motivates importance? – yes, many disciplines and unanswered questions
 - Reference to previous works? – Yes, a ton of them
3. Coherent structure
 - Clarity of exposition? – Could be better, it is all very brief and assumes a lot of prior knowledge, might be due to constraints for length for publishing

- Reinforcement of key message? – yes, but they introduce multiple new things in the Discussion to do so
 - Intro – Statement – Calculations, Simulations, Experiments – Discussion? – Yes
4. Logic flow
 - Information is logically sequential? – Yes, time intervals -> energy -> energy histograms -> energy release scaling -> interval scaling with inverses of previous data
 - Conclusions follow logically? – Yes, they are drawn from data, but I'm not sure how badly they massaged the data because the used logarithmic binning which I don't know anything about
 5. Simple
 - As simple as possible? – Kind of, I don't know enough to really judge that, I would have left out some things, but I can't say if they were necessary
 - Excess notation? – No
 6. Readable
 - Use of appendix for non-essential technicalities? – Yes, online datasets and stuff
 - Consistent notation? – Yes, consistent and sparingly
 - Good use of figures? – Yes, three figures that illustrate the data
 - Experiments, Simulations, Theories support key message(s)? –

3 Lecture 23.01.2020

To make references to equations in the text, type `\label{<name>}` and then refer to it using `\ref{<name>}`, it will automatically be done.

There is a command for splitting equation over multiple lines, look it up.

3.1 Greek letters

Name	Symbol
pi	π
chi	χ
rho	ρ
Pi	Π
Psi	Ψ

3.2 Symbols of binary operations

Name	Symbol
big triangle down	∇
dagger	\dagger
minus	$-$

Name	Symbol
times	\times

3.3 Unusual symbols

Name	Symbol
approximately	\approx
parallel	\parallel
not in	\notin

3.4 Inline formulae

- $M = \{x \in A \mid x > 0\}$
- $f: X \rightarrow Y$
- $\tan \alpha = \tan \alpha, \ln(e) = \ln(e)$
- It is easy to see that $23^{1993} \equiv 1 \pmod{G}$
- $\text{sum} = \sum_1^n x$
- $\text{product} = \prod_1^n x$
- $\text{supremum} = \sup x$
- $\text{limit with upper bound} = \overline{\lim} x$

3.5 Big formulae

$$\sum_{i=1}^n n^2 = \frac{n(n+1)(2n+1)}{6}$$

$$\overline{\lim}_{n \rightarrow \infty} a_n = \inf_n \sup_{m \geq n} a_m$$

$$\oint_{-\infty}^{+\infty} f(x) dx = \frac{1}{3}$$

$$\oint_{-\infty}^{+\infty} f(x) dx = \frac{1}{3}$$

$$\prod_{n=1}^n i = 0$$

3.6 Symbols of other operators or special characters

Name	Symbol
partials	∂

Name	Symbol
infinity	∞
nabla	∇
for all:	\forall :
norm	$\ A\ $
asterisk	$*$
not equal	\neq
in, owns	\in, \ni
greater or equal	\geq
lesser or equal	\leq

4 Lecture 28.01.2020

- new command `\mbox`
- to break a line we can use `\\`, in text also `\newline`
- to break a line, we can use `\linebreak`
- the size of a newline can be specified in brackets `\\[5pt]`
- we can also use `\smallskipamount` and larger variants of that
- to quote: `\begin{quote} text \end{quote}`, this is just some normal text that should not concern the quote that I am writing here

this is a quote of utmost importance. It is so important that I will put it into quotation mode. Hopefully people will pay attention.

Now we should continue with normal text and the quote should be finished now. Let's see how this will look when it is compiled using **pandoc**.
- `flushleft`, `flushright`, `center` can be used to align text
- Here is some text
Which is formatted to be right-aligned in pandoc and not in latex

4.1 Itemize

- test 1 Some wild text:
 - sub 1
 - sub 2
 - under other list
- ```

\begin{itemize}
 \item test 1
 Some wild text:
 \begin{itemize}
 \item sub 1
 \item sub 2
 \end{itemize}
 \item under other list
\end{itemize>

```

## 4.2 Enumerate

1. number 1
2. number 2
  - (a) sub number 1
  - (b) sub number 2
3. below sub list

```
\begin{enumerate}
 \item number 1
 \item number 2
 \begin{enumerate}
 \item sub number 1
 \item sub number 2
 \end{enumerate}
 \item below sub list
\end{enumerate}
```

## 4.3 Images

- to insert images or .svg files it is best to put them in the same folder as the tex source file
- using `\usepackage{svgproc}` is good when one wants to work with these kinds of files

## 5 Lecture 30.01.2020

- British Council on Abstract and how to write them well
- the file could be very useful if we ever need to write any kind of abstract
- every part of our future papers should be very well thought out
- there tend to be very critical details in there that one needs to think about
- Competencies (p. 7)
  - Achievement
  - Analytical Thinking
  - Professional Confidence
  - Relationship Building
- Key Questions
  1. What is an abstract?
  2. Who is an abstract for?
  3. Why write an abstract?
  4. When do we write them?
  5. How long should they be?
- references, at least in Chicago style, you put references in the footnotes of the page and put a raised number at the place of citation

## 6 Lecture 04.02.2020

### 6.1 Midterm project

- report (>15 pages) and presentation (10 min)
- end of February
- topic: choose on our own, just something mathematical
- written L<sup>A</sup>T<sub>E</sub>X report
- number of pages: > 15
- based on that report we will prepare presentations
- presentation can be ppt, beamer, prezi, etc.
- paper should contain some kind of controversy: general sentiment is this, but science say otherwise
- what are we thinking and why, what are the reasons for that?
- we will get an example of a report from last year
- all the latex things that we have considered should be included
  - upper and lower footnotes
  - change margins if told to
  - page numbering
  - numbering references, citations
  - acknowledgements
  - chapters, sections
  - toc
  - formula numbering
  - different types of indents
  - all the major parts of a paper, including abstract
  - title page
- presentation based on that report
  - will be discussed in future classes
  - the how and what with eyes and hands and all of that
- structure
  - title page
  - abstract
  - toc
  - introduction
  - main part with multiple sections
  - conclusion
  - acknowledgements
  - references

### 6.2 Notes

- we can download TexLive to locally compile stuff
- it is quite big and he is showing us how it would work
- abstract: passive voice
- references: `\cite{<name>}` to cite a specific thing in your bibliography
- topic 6 will have an example paper for us



## 7 Lecture 06.02.2020

### 7.1 Abstract

-abstract of the paper *Application of Additional Argument Method to Burgers Type Equation with Integral Term* - sentences are all very short - no connection between sentences - it contains all the important information - no flow in the abstract - maybe a bit too long? haven't checked

### 7.2 Report

- presentation on report
  - *why* did you do it (Motivation/Introduction)
  - *how* did you do it (Method/Theory)
  - *what* did you find (Results)
  - *what* does it mean (Discussion)
- presentation principles (Aristotle)
  1. tell what you are going to say
  2. tell it
  3. tell what you said
- a good talk is about **one main idea**
- for a 10 minute report somewhere around 20 slides are good
- title slide, intro slides, Q&A slide as well
- $\leq 7$  lines per slide
- don't have too much text and do not read from you slides
- voice and body language
  - don't fold your arms
  - look at your audience
  - be enthusiastic
  - move a bit on the stage
  - make eye contact
- tell a story but do not make it a riddle, tell the audience where you will end up and how you will get there
- use appropriate jargon that your audience can understand
- make the presentation a mix of technical and non-technical jargon
- try to keep it as simple as possible
- practice giving talks before – practice leads to a sigmoid improvement curve
- optimize time and don't go too slow but also not too fast
- allow questions (or not), but tell people
- include something visual in every slide
- **DON'T END LATE**

## 8 Lecture 11.02.2020

- 30 seconds per slide, we should print out the paper and submit the `.tex` and `.pdf` files
- now we'll talk about the abstract for one of his papers

### 8.1 Talks

- are not papers
- level should fit the audience – know the level of your topic and the audience
- don't be intimidated by the audience
- don't try to impress the audience with your brilliance
- **first half or third of the presentation should be completely understandable to anybody in the audience**
  - explain the problem
  - what is the conflict or controversy between the generally accepted view and this research
- carry everyone along and just be a good speaker
- talk about examples
- prove only easy results if at all, only hint at how it's done if it is difficult
- concentrate on qualitative analysis and not quantitative analysis
- put your results in context
- **don't introduce too many ideas**
- plan your time well and don't go over the time limit, rather end 1 or 2 minutes early
- plan your talk well, but be ready to make changes to your plan
- beginning: tell an interesting story that all of us will find intriguing, present a question that provides suspense, then satisfy the audience by providing the answer they are craving

## 9 Lecture 13.02.2020

### 9.1 Homework – Better Abstract

#### 9.1.1 Original ~66 words

Application of Additional Argument Method to Burgers type equation with an integral term on the right-hand side was considered. A scheme of the method for the Burgers type equation is constructed. The validness of the scheme construction using Computer Algebra System (CAS) Maple was proved. The capability of modern CAS to prove mathematical theorems was demonstrated. The graphical solution of the series sample equations was constructed.

### 9.1.2 Rewrite ~65 words

This paper considers an application of the Additional Argument Method to the Burgers' equation with an integral term on the right-hand side. The scheme of this method for Burgers' equation is constructed and its validity proven using the Computer Algebra System Maple. The proof demonstrates the capability of these systems to prove mathematical theorems. Furthermore, the graphical solution of the series sample equations is constructed.

*What is Burgers' equation/why is it useful?*

*What does that mean?*

*What does the integral term signify?*

## 9.2 Notes

Source: Write Applied.pdf

Building a Draft

1. tentative title
2. sketch of the abstract
3. structure of the results section
4. prepare all the figures
5. write down the content of all of the sections of the body
6. sketch the discussion
7. write down an introduction
8. rewrite discussion and abstract

### 9.2.1 Goals of a Paper

- convince the reader that what you are saying is sound
- the reader should understand and appreciate the beauty of the mathematics you are presenting

### 9.2.2 Definitions

- research = the *systematic* investigation into a and study of *materials and sources* in order to establish *facts* and reach new conclusions.
  - we need a plan, sequential discovery by building on precious discoveries
  - If I have seen further is by standing on the shoulder of giants. –Isaac Newton
- fact = consistent with objective reality or can be proven
- scientific method = falsifiable from evidence
- mathematical proofs = exhaustive reasoning, always true
  - inference rules, axioms, theorems

### 9.2.3 Literature Search

- LiteratureSearch.pdf

### 9.2.4 Other Notes

- stuff is supposed to be connected to other parts of a paper
- check for internal coherence and stuff
- be scientific
- main purpose of writing is to communicate
- style of writing mathematical papers: solve old problem with a new method or new problem with old method
- use a software that can adequately handle mathematical expressions
- abstract in passive voice, present tense
- introduction should contextualize the topic and motivate the reader to read further
- build on previous research, synthesize questions that have already been addressed
- in the conclusion your work should be related to other people's findings should be talked about
- abstract should catch the interest of people that work in your and close fields
- do not use symbols in the abstract if you can help it, if you use them, use them more than once
- when he says controversy he means that there should be some revelation that might not be immediately obvious
- usually less than 200 word limit for abstracts, maybe 300 words or 3000 symbols
- obviously a good understanding of the literature is required to make this work
- **reasonable amount of creativity creativity**
- get ready to work on difficult, unsolved problems, to be stuck

## 10 Lecture 18.02.2020

## 11 Lecture 18.02.2020

### 11.1 Homework – Better Abstract and Introduction

#### 11.1.1 Original ~574 words

##### 11.1.1.1 Abstract

Application of Additional Argument Method to Burgers type equation with an integral term on the right-hand side was considered. A scheme of the method for the Burgers type equation is constructed. The validness of the scheme construction using Computer Algebra System (CAS) Maple was proved. The capability of modern CAS to prove mathematical theorems was demonstrated. The graphical solution of the series sample equations was constructed.

##### 11.1.1.2 Introduction

A new method for studying partial differential equations, later called "the Additional Argument Method"(AAM) was developed in the works [1]– [5]. This method allows to reducing partial differential equation to the system of integral equations, which is much

easier to analyze in terms of the existence and uniqueness of solutions. Naturally, the idea of application of the Method to investigate the classic problems appeared. One of them is the Burgers equation which is the particular one-dimensional case of the Navier-Stokes equation. Besides the applications to hydrodynamics, Burgers equation has applications to wide variety of knowledge fields. For example, the Burgers equation is used in macroeconomics to model development of the "World Economy" system [6].

$t$  is the time interval of consideration,  $KS$  is the self-organization coefficient, the structural characteristics, the parameter, which describes the economical usefulness, the effectiveness of political system structure and characterizes dissipation minimization and capability to optimize resource distribution for industry and benefits for consumption.

$l=Y$  is the production of goods in the time interval  $t$  is the output speed or economic growth in the time interval; is economic growth rates;  $LQ=LKN$  is skilled labor or population of the country taking into account labor qualification where :  $L$  is population;  $L$  is population growth rate;  $L$  is population growth rate;  $N$  is population with higher education;  $KN$  is coefficient of qualification of work of public system, characteristics of the growth of structural information, expressed by created new knowledge. Creating new knowledge is the intellectual labour of the population with higher education, expressed by the growth of the population with higher education  $N$ .

Another example of Burgers equation application is the single-band transport stream modelling. This macroscopic (hydrodynamic) model was developed by Witham G. ([7],1974). In contrast to the previously proposed models, based on the law of conservation of the number of vehicles, the "farsightedness" of driver s was taken into account [10]. where  $Q(p) = pv(p)$ ;  $p(t,x)$  is the amount of transport per unit length at time  $t$  in the neighborhood of a route point  $x$ ;  $v(t,x)$  is velocity at time  $t$  in the neighborhood of a route point. The left-hand side of equation (1) represents the conservation law of transport. The diffusion terms appearing in the right-hand side of equation correspond to the fact that drivers reduce speed with increasing traffic density ahead and increase speed when decreasing.

In the work [2] the scheme of the additional argument method is implemented for the various classes of equations. In this paper the solution of the particular equation was verified. The solving of this problem is quite complicated and time-consuming. Therefore the decision to use of the CAS Maple to facilitate verification of the correctness of the solution was taken. In the following part of the paper the theoretical bases of Additional Argument Method is given. The detailed prove of the theorem using Maple is provided. The test example with the known analytical solution was compared to the solution obtained by AAM. Then the solution of the problem with integral term on the right hand side is provided. This theoretical analysis is followed by sample equation with the numerical solution and it's graph.

## 11.1.2 Rewrite ~265 words

### 11.1.2.1 Abstract

This paper considers an application of the Additional Argument Method to the Burgers' equation with an integral term on the right-hand side. The scheme of this method for Burgers' equation is constructed and its validity proven using the Computer Algebra System

Maple. The proof demonstrates the capability of these systems to prove mathematical theorems. Furthermore, the graphical solution of the series sample equations is constructed.

### 11.1.2.2 Introduction

The *Additional Argument Method* (AAM) is a new method for studying partial differential equations which was developed in the works [1]–[5]. The AAM allows partial differential equations to be reduced to a system of integral equations whose existence and uniqueness of the solutions is easier to analyze. Accordingly, applying this method to classic problems is of interest. One such classic problem is the Burgers equation, the particular one-dimensional case of the Navier-Stokes equation. Besides its applications to hydrodynamics, the Burgers equation is used in macroeconomics to develop the “World Economy” system [6] and to model single-band transport streams [7].

The scheme of the AAM is implemented in [2] for various classes of equations. This paper verifies the particular equation using the Computer Algebra System Maple because the solving of this problem is quite complicated and time-consuming. First, the theoretical bases of the AAM is given and a detailed proof of the theorem using Maple is provided. An example with a known analytical solution is compared to the solution obtained through AAM. Then, the solution of the problem with an integral term on the right-hand side is provided. Finally, a sample equation with the numerical solution and its graph is shown.

## 11.2 Notes

### 11.2.1 Plagiarism

- *definition:* Plagiarism is presenting someone else’s work or ideas as your own ,with or without their consent, by incorporating in into your work without full acknowledgement
- only two ways: solving old problem with a new method or new problem with old method
- other problems that are very similar but not identical can be good sources
- another definition from QMUL: presenting someone else’s work as one’s own irrespective of intention. Extensive quotations; close paraphrasing; coying from the work of another person, including another student or using the ideas of another person, without proper acknowledgement, also constitute plagiarism
- taking other peoples work and presenting it as your own
- you have to imagine what the reader will believe from what you have written
- **plagiarism is a disciplinary offense**
- if more than 30% of the diploma is cited from an unknown source it is considered plagiarism
- for math – because it is so difficult to check – there is a AMS website that will check up whether or not something was plagiarized
- is it plagiarism if you submit a paper that contains already published results even though those results were attained by you? probably yes
- you would certainly get 0 for your project and the possibility of expulsion is definitely there

- transliteration is an effective way to fake out plagiarism detection software
- **our diploma project should at least contain one new idea from us**
- *bibtex* and *cite* for citing are recommended
- citing also adds value to your work because it shows that you did work etc
- citing too much is better than citing too little
- types of plagiarism
  - verbatim copying: **Ctrl + C**, **Ctrl + V**
- in math we don't generally argue from authority, even though some quotes might be good for context
- when repeating arguments one should paraphrase which does not mean the same sentences with slight changes – read the argument, close the book, repeat it in your own words
- if your argument is very similar to something that has been done before you *must* give attribution
- in math you could say something like “using the ideas of 's proof” or “following ” to express that you are orienting your work on someone else's
- don't take images or videos without express permission and then you will still have to cite them
- **create your own diagrams where ever possible**
- you could technically cite Wikipedia, but just don't. Cite a proper source.
- **choose supervisors now and not later**

## 12 Lecture 20.02.2020

### 12.1 Presentations

- short presentations on our chosen topics of interest

Ilya

- state full name
- Poincare conjecture open 3D set without borders, he said it is homomorphic
- every open space is homomorphic with a sphere
- morphisms: isomorphism, homomorphism, . . . – relations between sets
- it is useful because even if one fails, it can be fruitful to “fail”
- their work can have applications in other fields, even if they did not prove the actual conjecture
- he did not state a controversy or something surprising – he could have done though
- stare at the presenter

Moritz

- use some kind of laser pointer when giving presentations
- look at the audience more

## 13 Lecture 25.02.2020

### 13.1 Presentations

- continuation of the small presentations on our topics

Elina

- the concept of zero in mathematics
- zero was really controversial for quite some time
- Aristotle and some other Greek scientists
- zero should not have existed in math
- until the 18th century it was hotly contended
- even today there can be some debate about it
- some cases where zero breaks
- talking pretty fast and not accentuating information by using tone of voice or speed or something else

### 13.2 Notes

- neuro-linguistic programming: *NLP* is a discredited pseudo-scientific pile of crap
- SCOPUS is a abstract and citation database by Elsevier
- Web of Science is something similar
- then there is the impact factor as a measure of how important journals are
- impact factor: the higher the impact factor, the higher the “level” of the journal
- kinda  $\approx$  (number of citations in other journals) divided by (number of papers in the journal)
- Scopus is the most important database, Web of Science is in second place
- read the paper and look at it
- find what is unacceptable in the paper
- Chicago Style provides citations in footnotes on the same page as the source is mentioned

## 14 Lecture 27.02.2020

Short Presentation by Aidai

- what is mathematical modeling
- it is something that we use often
- understanding it better would be cool

Short Presentation by Saadat

- dark matter and dark energy
- current discovery of parts of dark matter
- it's hard to “catch” them so this is cool
- it could help answer questions about the nature of the universe



- dark matter was created after the big bang
- dark matter attracts, dark energy repulses – one of the reasons that the universe is expanding
- *dark energy is faster than light?* – I feel like this is a weird way to state it
- dark matter consumes light?
- has a very strong gravitational force

Notes

- people cannot concentrate for 75 minutes
- thus it makes sense to split something like that into 10 sections of about 7 minutes each

To improve my presentation

- add some examples for various things
- for example, show one graph of an orbit and then use the graph to visually explain the different elements that we can measure and graph them as well
- this would make it a lot more understandable
- more voice modulation
- no chewing gum
- use some bold type face to highlight stuff
- explain it in the most simple terms
- give examples for each of the types
- transfer the presentation to proper latex

## 15 Lecture 10.03.2020

- today we will hear presentations on the chosen topics

*Bayesian Inference* – Akylbek Sultanov

- named after Thomas Bayes who wrote a book about it
- updates a probability when more information becomes available
- example: is the long haired person male or female? most men have short hair, so the best guess is woman – too much explanation of the example
- $P(A) * P(B) = P(A) * P(A|B)$
- Bayes' Theorem:  $P(A|B) = P(B|A) * P(A)/P(B)$
- incorrect probabilities – what a moron
- What does statistical inference mean?

*Mathematical Modeling* – Adaid Iskenderova

- modeling is a representation of a real world problem in math. form
- generally parts of theory and experiments
- very popular in different areas of science
- process of modeling – the different stages
- modeling is a process or a cycle that is repeated until the model is as accurate as it needs to be for whatever task it is needed for

- Predator-Prey-Model – Lotka-Volterra-Model, an oscillation between different population sizes
- building the actual model from basic equations
- this model results in a cycle of increase and decrease of predator and prey numbers

## 16 Lecture 31.03.2020

- we're going to get some presentations via webex?
- we are doing screen sharing for sure
- now well so some latex stuff
- **mathpix snipping tool**
  - this software takes pictures of equations and transforms them into latex code that we can use in our own latex projects
  - the code can then be copied into any kind of latex or even markdown document and then you have the equation without having to type all that stuff manually
  - this should make our work a lot easier
  - it can even correctly transcribe large amounts of text that has formulas and all that stuff in it
  - Mathpix Snips is an online maths editor that we can use if we want
- **pick any of our files from our computer, put the file there, then share it with him**
- it worked pretty well

### Questions

1. Is it possible to convert a large file at once ( $> 100$  pages)?
2. Is it possible to properly convert text in different languages?
3. Is it possible to convert hand-written files?
4. Is it possible to convert the obtained file into a `.doc` file?
5. Is it possible to make proper changes to the typesetting of converted documents?
6. Is it possible to recognize scanned text?

The goal is to provide this software to teachers at a school and university level and they should have to deal with latex as little as possible. Mathpix Snip looks like a pretty full-featured markdown and latex editor. It has support for latex and markdown commands at the same time which could be super useful.

He wants to create a tutorial for the AUCA community on how to use this service for what purpose exactly? I'm not quite sure what the purpose of this really is. Would anyone actually use this program?

## 17 Lecture 02.04.2020

### 17.1 Homework

#### 17.1.1 Questions

1. Convert large files at once?

I did not see anything about that in the documentation. There is an API for OCR, but that would require some work that either someone would have to set up or teachers could not do. The API **costs money**. OCR is never perfect – each page would require work to be made perfect. The API **does not support Cyrillic**.

2. Different typesets or scripts?

The documentation does not contain information about that. Just the basic mark-down and latex font and types are supported. The program does not recognize Cyrillic. **Mathpix Snip does support Cyrillic (probably unicode), but the OCR does not**

3. Pictures of handwriting?

It works decently well, but like with any OCR, proof reading will always be necessary.

4. Create a .doc file from the Snips?

Not directly. PDF download works, then a pdf to doc converter needs to be used. This will then destroy the formatting and certainly the maths. Equations are inserted as pictures. This does not work well.

5. Change font size and typesetting in Snips?

It only provides a **limited range of formatting options**

6. Recognize scanned pdfs?

Yes, it seems to work on decently readable pdfs, but not totally. It cannot recognize columns in pdfs.

#### 17.1.2 Is this suitable for teachers?

No.

- cannot convert multiple things at one unless one pays
- OCR is never perfect and takes a lot of work
- OCR does not support Cyrillic
- handwriting is not error free
- no direct or easy conversion to doc
- limited formatting option in the online editor
- recognition of printed and then scanned documents is sloppy, columns are not recognized
- Latex or Markdown are not things most people would want to work with if they are not that computer literate

#### 17.1.3 Alternatives

Google Docs has decent OCR that could be used and is simpler for all involved

## 17.2 Notes

- we cannot use multiple OCR programs at once, that is not a good idea at all
- also using different programs – unless someone puts a ton of work into integration – will not be a useable solution
- he shows that the OCR does not work that well and that it takes some time to work out all the issues that the OCR produces
- even he does not know how to use this flavor of latex-markdown-whatever – how can he expect anyone to use this stuff
- write down or collect some stuff – take a photo with a phone and then use Mathpix ocr with it – *this is so unnecessary*

## 17.3 Homework Assignment

1. improve handwriting to make it simpler for the program to recognize
2. put an image into mathpix
3. find good OCR for documents that contains Russian or Kyrgyz
4. put references into a document
5. does it recognize references? 3 different ones
6. can it recognize handwritten links or email addresses?
7. create a 2-3 page file to send by email that has all the elements of a normal paper
8. test the formatting recognition – can it recognize underlined words?
9. equation numbering – can it be recognized?

## 18 Lecture 09.04.2020

### 18.1 Homework

Kyrgyz or Cyrillic OCR: <http://www.i2ocr.com/free-online-kirghiz-ocr>

here is a typical url: <https://www.auca.kg/>

here is a typical reference [1]

[1] This is a reference

Snip turns the above text into:

Kyrgyz or Cyrillic OCR: <http://www.i2ocr.com/free-online-kirghiz-ocr> here is a typical url: <https://www.auca.kg/> here is a typical reference [1][1] This is a reference

All of this is to be expected because snip is not supposed to work like this

## 19 Lecture 14.04.2020

- final report is due on May 5
- to be submitted
  - latex file

- pdf file
- printed out copy
- open: choose a topic for your report freely:
  - based on some kind of differential equation
  - should contain some idea of common interest: something with unexpected result that could not have been guessed
  - at least 20-25 pages
  - title page
  - table of contents
  - acknowledgement
  - pictures
  - graphs
  - tables
  - references
  - all the theoretical latex elements
  - cite stuff correctly
- if topic choice is difficult: next class he will assign us a topic
- reminder: research methods in mathematical sciences / applied math talk file on e-course
- do we need to make a presentation? If quarantine is stopped we will present in person and in front of other faculty
- **email him a topic before next class – make a topic proposal**
- presentation should be 10 minutes long because anything longer is not interesting
- we should prepare 2 slides per minute approximately

## 20 Lecture 16.04.2020

- Lobachevskii Journal of Mathematics – dude worked with non-euclidean geometry
- SCOPUS database has citation score etc:

$$\text{CiteScore} = \frac{\text{Citation Count year}}{\text{Document Count previous 3 years}}$$

- introduction, main section etc
- to get certain accreditation, AUCA needs 100 papers in SCOPUS journals in the last 5 years
- predatory publishers are excluded from scopus listings
- elsevier is a giant publishing house

## 21 Lecture 21.04.2020

- the report should be very well structured from the beginning
- how can we convey the topic most effectively
- deadline for the report is May 5, for presentation and all of it it's 14th May
- Thursday May 7 would be the first day where we have presentations

- in Maple we can do symbolic laplace transforms he just talks about ways to zoom in maple
- a paper prepared in Maple can be converted into Latex without much difficulty
- some stuff as a maple tutorial
- DEplot in Maple plots DEs for whatever values you set for it
- autonomous system does not depend on time – is that a realistic description of L-V equations
- what are the merits of a phase portrait with level curves vs without level curves could be something to cover in the paper
- use sagemath to solve L-V systems in different ways for the numerical section
- why wouldn't one prepare a paper in maple? Because maple is expensive closed-source software

## 22 Lecture 23.04.2020

- advisor comments by E. Burova:
  - we cannot enroll into the Operating Systems course – just reserve time and credits for the course and then we'll be enrolled
  - Osmonov will teach the course slightly differently because we have some pre-requisites but the course
  - Economic modeling will be discussed by her and we'll be signed up in add/drop period
  - internship is still not clear, maybe in summer or at the beginning at fall semester
    - the courses for that will actually not be at that time
  - research station of the russian academy of science
  - there will be an interview with students on May 5, 2:30pm up to an hour of questions – I will participate
- how to convert maple worksheets to latex – with lots of problems
- he is missing the `maplestd2e.std` file

## 23 Lecture 28.04.2020

- mathscinet is a website by ams that has mathematical reviews
- is a database for publications
- msc - mathematical subject code
- has 3.7 million publications
- MR##### is the mathematics database of ams, MR#### is the journal
- you have the subject classification numbers that exist in all sciences
- zbMATH
- mathematics subject classification system