

Poster Session

Week 3

Roy Klaasse Bos



Technische Universiteit
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University of Technology

Where innovation starts

Group Composition

GROUP	STUDENT
The Koala's	Melissa Baars
The Koala's	Elise van Wijngaarden
The Koala's	Eileen Moree
The Koala's	Laure van der Sanden
Comparing apples with peers	Job Harweg
Comparing apples with peers	Jasper Lagendijk
Comparing apples with peers	Pepijn van de Water
Comparing apples with peers	Lucas Poppelaars
The Keyboard Warriors	Boris Binnendijk
The Keyboard Warriors	Jesper Griesven
The Keyboard Warriors	Simon Wijntjes
The Keyboard Warriors	Max Quintus
Scitylana Atad	Ana Pereira
Scitylana Atad	Georgi Naumov
Scitylana Atad	Luca Faust
Scitylana Atad	Ruben Lathuy

GROUP	STUDENT
T.A.S.	Toon Bense
T.A.S.	Adriaan Karsmakers
T.A.S.	Sander Schepers
John Does	Robbert Dekkers
John Does	Campfens Jair
John Does	Christian van Erp
John Does	Est van Krijn
Satoshi Nakamotos	Jesse Mommersteeg
Satoshi Nakamotos	Maxim Mosneaga
Satoshi Nakamotos	Anneke Theunissen
Satoshi Nakamotos	Filip Vujovic

Choose your questions carefully

A1. Are the budgets similar for all genres (comedy, action, ...)? Describe the differences and similarities. Find possible explanations.

A2. Choose one month of the year. Are the percentages of movies released in that month similar for all genres (comedy, action, ...)? Describe the differences and similarities. Find possible explanations.

A3. Is there a relation between profit (= Worldwide Gross minus Production Budget) and budget? If so, describe this relation.

B1. Try to predict profit (= Worldwide Gross minus Production Budget) based on genre, budget, the number of critical reviews, and the number of Facebook likes. How good are your predictions?

B2. Try to find groups of similar movies based on total budget, length of the movie, the IMDb score (IMDb = Internet Movie Database), the number of critical reviews, and the number of Facebook likes for the first actor. Provide a description of each group - for example the typical movie per group, relation with genres etc.

Choose your questions carefully

A1. Are the budgets similar for all genres (comedy, action, ...)? Describe the differences and similarities. Find possible explanations.

Choose your questions carefully

A2. Choose one month of the year. Are the percentages of movies released in that month similar for all genres (comedy, action, ...)? Describe the differences and similarities. Find possible explanations.

Choose your questions carefully

A3. Is there a relation between profit (= Worldwide Gross minus Production Budget) and budget? If so, describe this relation.

Choose your questions carefully

B1. Try to predict profit (= Worldwide Gross minus Production Budget) based on genre, budget, the number of critical reviews, and the number of Facebook likes. How good are your predictions?

Creating dummy variables



Country	Country_Netherlands	Country_Belgium	Country_Germany
Netherlands	1	0	0
Belgium	0	1	0
Germany	0	0	1
Netherlands	1	0	0
Netherlands	1	0	0
Germany	0	0	1
Belgium	0	1	0

YouTube tutorial: https://www.youtube.com/watch?v=0s_1lsROgDc

Choose your questions carefully

B2. Try to find groups of similar movies based on total budget, length of the movie, the IMDb score (IMDb = Internet Movie Database), the number of critical reviews, and the number of Facebook likes for the first actor. Provide a description of each group - for example the typical movie per group, relation with genres etc.

Example poster lay-out

Name
Student number
Date

Title

DAE logo
TU/e logo

Introduction

Question 1
Question 2

Chart Title

Category	Series 1	Series 2	Series 3
Category 1	4.0	2.0	3.0
Category 2	2.0	4.0	3.0
Category 3	3.0	4.0	2.0
Category 4	4.0	2.0	5.0

Caption Q1

Interpretation Q1

Chart Title

Category	Series 1	Series 2	Series 3
Category 1	4.0	2.0	3.0
Category 2	3.0	4.0	2.0
Category 3	2.0	4.0	3.0
Category 4	3.0	2.0	4.0

Caption Q2

Interpretation Q2

Discussion

Conclusion

References

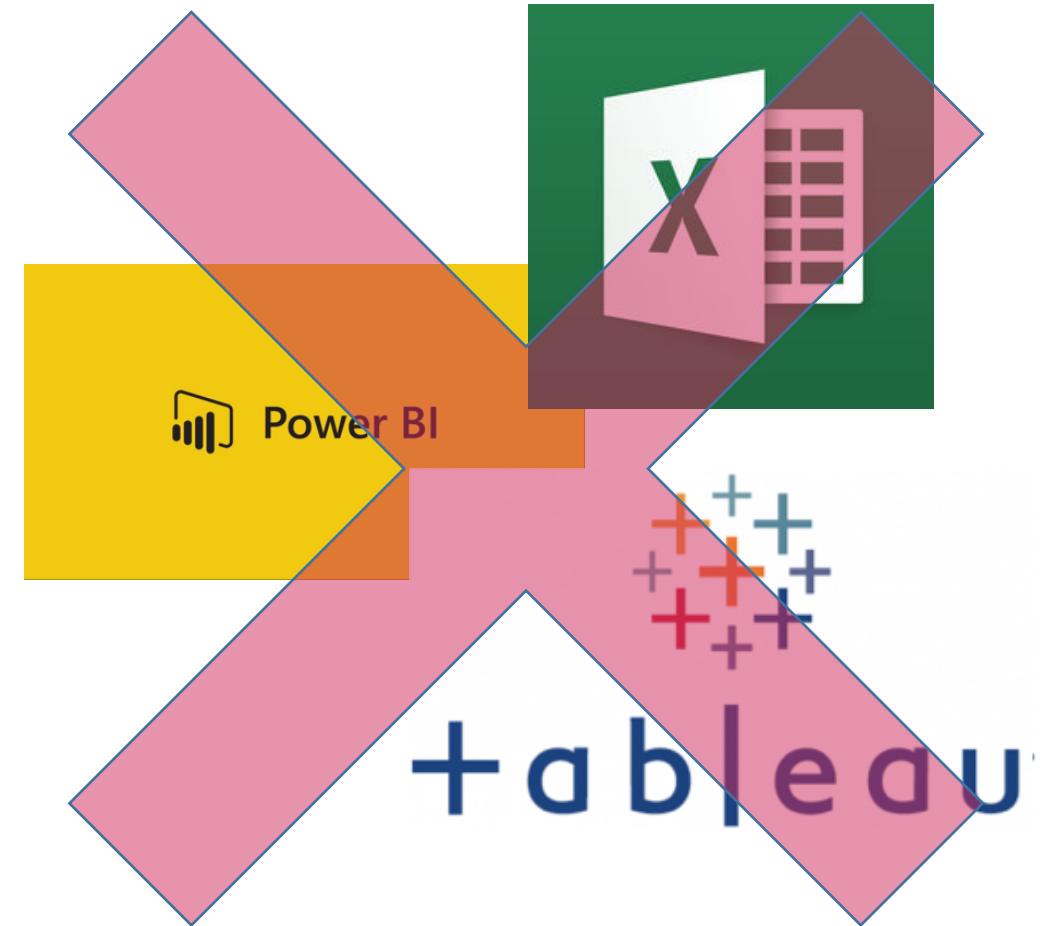
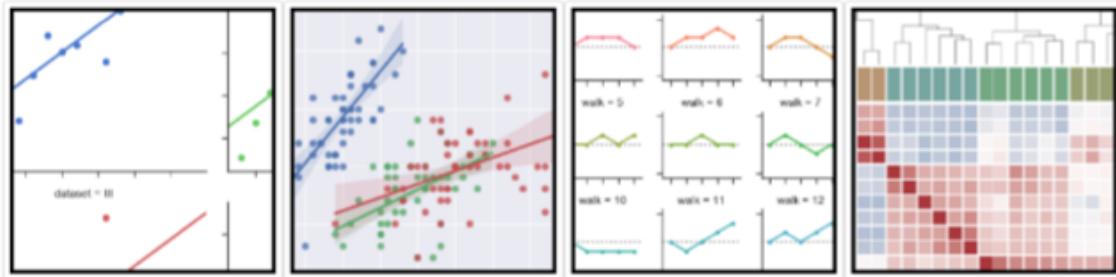
15 grading criteria

Criteria	Weight
Poster lay-out	6.7%
Introduction	13.4%
Question 1 + Visualization + Interpretation	33.3%
Question 2 + Visualization + Interpretation	33.3%
Discussion	6.7%
Conclusion	6.7%

Visualization Tools

matplotlib

seaborn: statistical data visualization



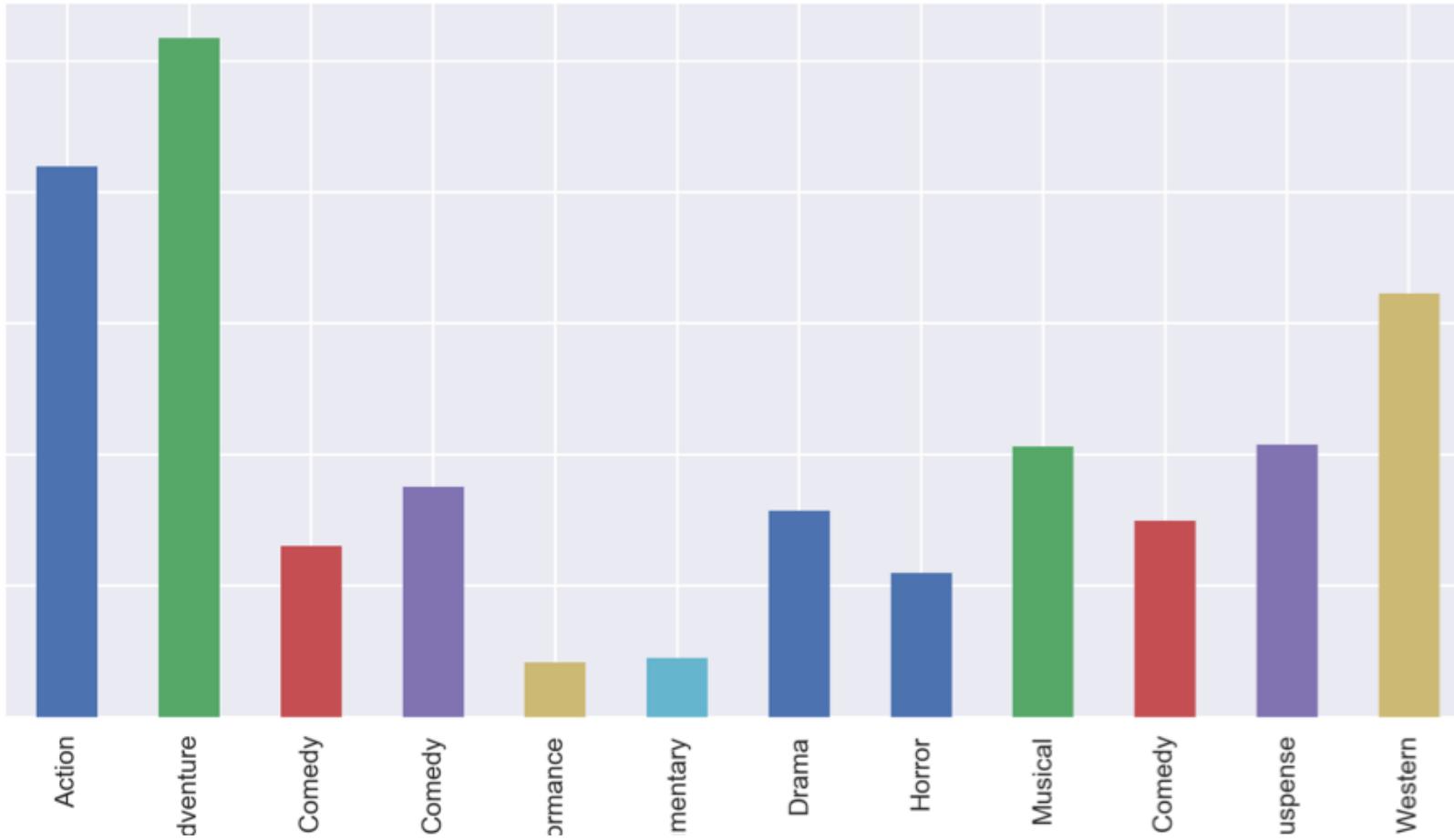
Use of Terminology

- Be **numeric**. Rather than saying:
 - “The duration of Horror movies is the longest.”
 - The duration for Horror movies (mean: 203 min., std: 22 min.) is remarkably higher than the duration of Drama movies (mean 124 min., std. 38 min.)
- Identify the **distribution** (unimodal/bimodal; symmetric/non-symmetric)
- Elaborate on **parameters** (e.g. depth decision tree, #clusters)
- Effect of potential **outliers**
- **Critically** reflect upon findings (e.g. sample size)

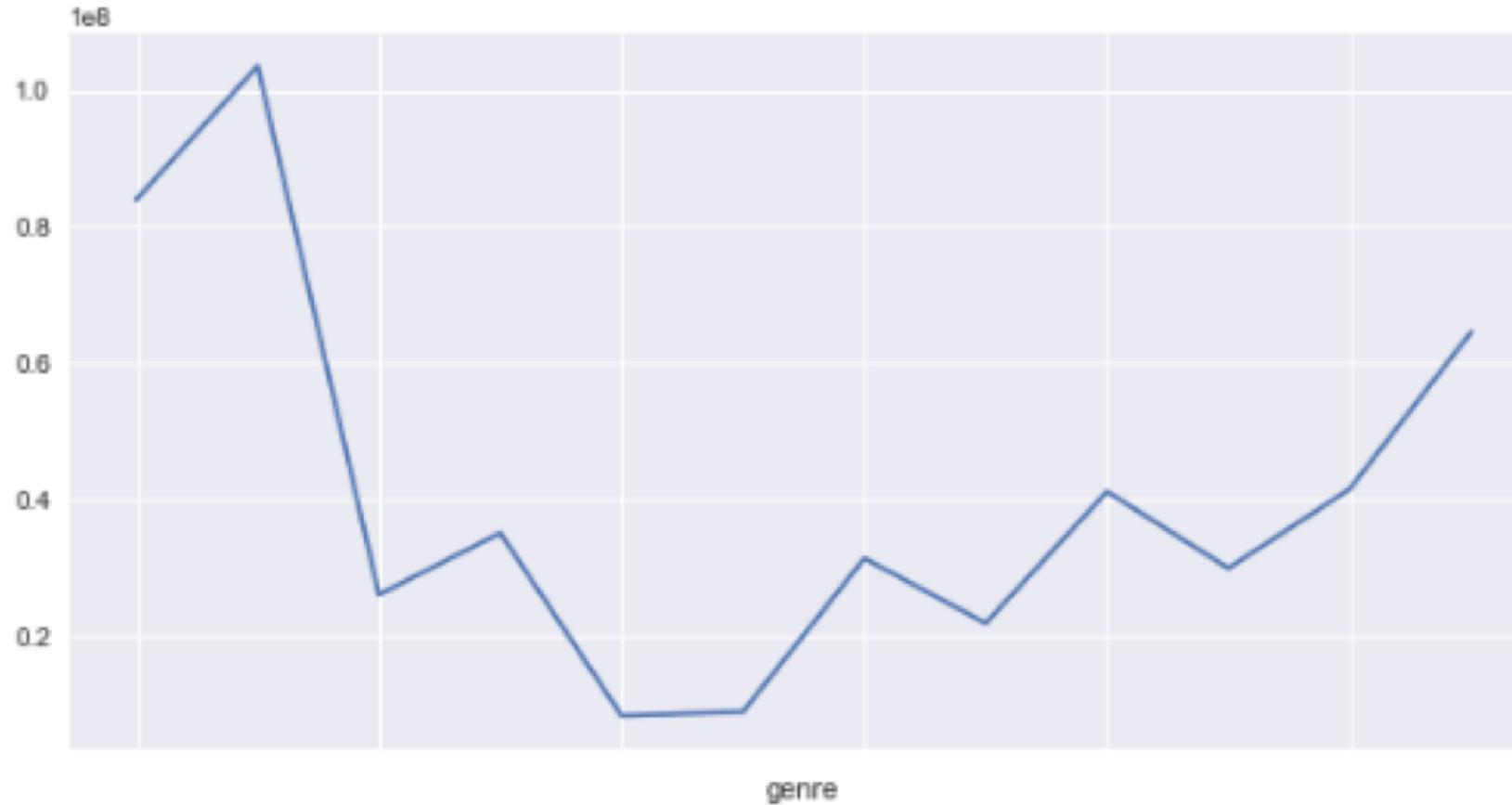
Export graphs in high resolution

```
plt.savefig('file_name.png', dpi=300)
```

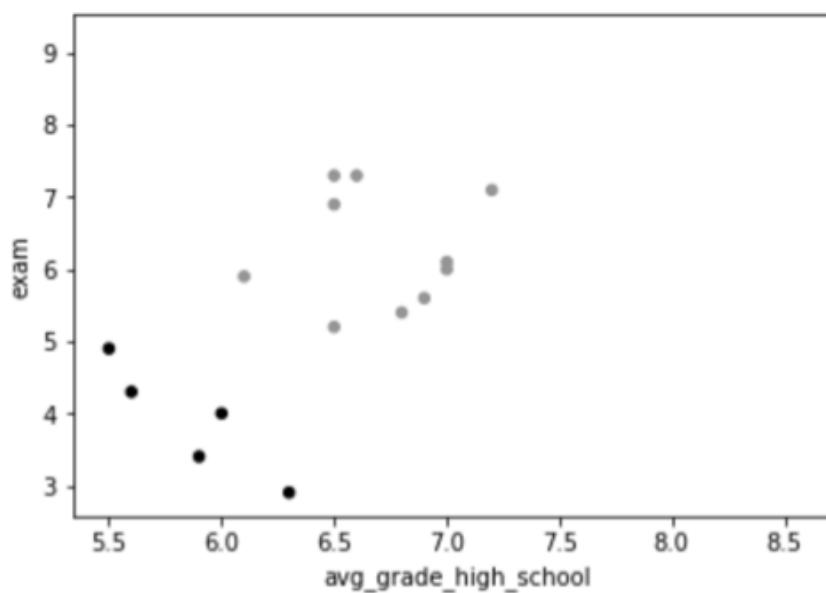
Repeated color usage



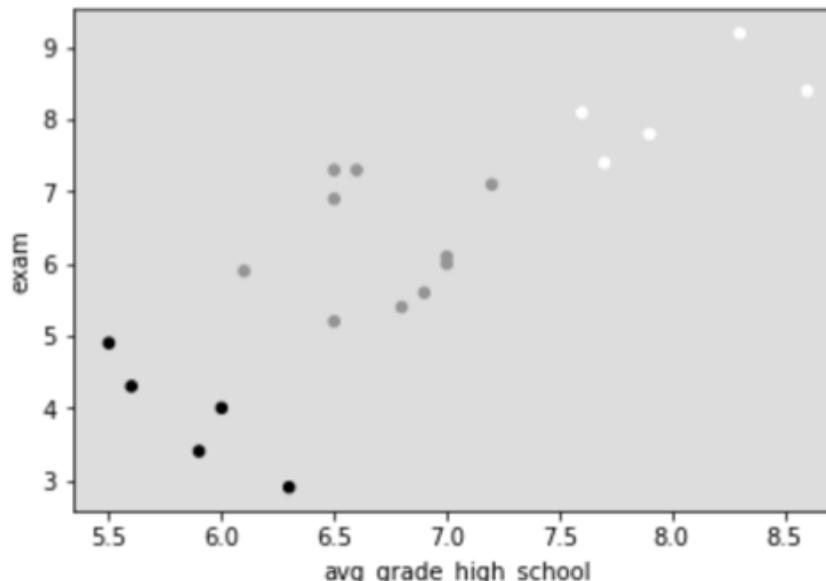
Mixing up categorical / numerical data



White Background



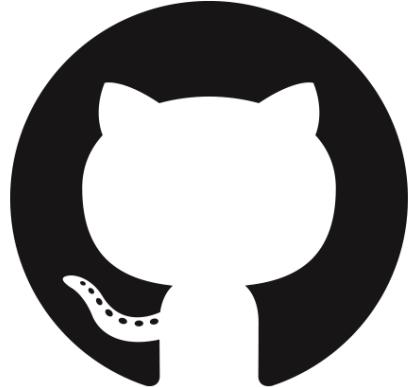
```
In [31]: # we cannot see the white dots! change the background color:  
ax = plt.gca()  
ax.set_facecolor('#dddddd') # grey color  
student_grades.plot(kind='scatter', x='avg_grade_high_school', y=
```



Poster Tools



PowerPoint Template



<https://github.com/RoyKlaasseBos/Data-Analytics-for-Engineers>

A Catchy Title

TU/e

Introduction

"Lorem ipsum dolor sit amet, consectetur adipiscing elit, sed do eiusmod tempor incididunt ut labore et dolore magna aliqua. Ut enim ad minim veniam, quis nostrud exercitation ullamco laboris nisi ut aliquip ex ea commodo consequat. Duis aute irure dolor in reprehenderit in voluptate velit esse cillum dolore eu fugiat nulla pariatur. Excepteur sint occaecat cupidatat non proident, sunt in culpa qui officia deserunt mollit anim id est laborum."

Question1 / Question2

"Lorem ipsum dolor sit amet, consectetur adipiscing elit, sed do eiusmod tempor incididunt ut labore et dolore magna aliqua. Ut enim ad minim veniam, quis nostrud exercitation ullamco laboris nisi ut aliquip ex ea commodo consequat. Duis aute irure dolor in reprehenderit in voluptate velit esse cillum dolore eu fugiat nulla pariatur. Excepteur sint occaecat cupidatat non proident, sunt in culpa qui officia deserunt mollit anim id est laborum."

Plot Title 1

Plot Title 2

Discussion

"Lorem ipsum dolor sit amet, consectetur adipiscing elit, sed do eiusmod tempor incididunt ut labore et dolore magna aliqua. Ut enim ad minim veniam, quis nostrud exercitation ullamco laboris nisi ut aliquip ex ea commodo consequat. Duis aute irure dolor in reprehenderit in voluptate velit esse cillum dolore eu fugiat nulla pariatur. Excepteur sint occaecat cupidatat non proident, sunt in culpa qui officia deserunt mollit anim id est laborum. Lorem ipsum dolor sit amet, consectetur adipiscing elit, sed do eiusmod tempor."

Conclusion

"Lorem ipsum dolor sit amet, consectetur adipiscing elit, sed do eiusmod tempor incididunt ut labore et dolore magna aliqua. Ut enim ad minim veniam, quis nostrud exercitation ullamco laboris nisi ut aliquip ex ea commodo consequat. Duis aute irure dolor in reprehenderit in voluptate velit esse cillum dolore eu fugiat nulla pariatur. Excepteur sint occaecat cupidatat non proident, sunt in culpa qui officia deserunt mollit anim id est laborum. Lorem ipsum dolor sit amet, consectetur adipiscing elit, sed do eiusmod tempor."

Full Name (student number) – 01-01-2018 – Data Analytics for Engineers (2017/2018)

Purpose of poster

A new way to online advertising: measuring an impression

Working prototype

The screenshot shows a 'Tracker log' window with event logs and two ads labeled 'Ad title' and 'Ad'. Red arrows point from the text labels to specific elements in the interface.

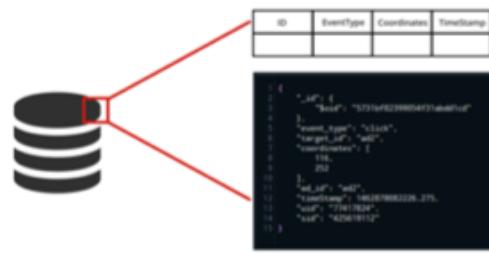
- Ad title → Click/hover on title
- Ad title → Click/hover on ad
- Ad title → Click/hover on button
- Score 25 → Impression score

Current situation



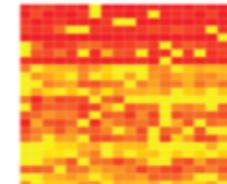
Do you want to see it with your own eyes?
View our prototype on honor.herokuapp.com

MongoDB database



Impression analyzer

Impression =
 $\#clicks_title * weight + \#hover_title +$
 $\#clicks_button * weight + \#hover_button +$
 $\#clicks_ad * weight + \#hover_ad$ etc.



Advertisement heatmap

Working prototype

The screenshot shows a 'Tracker log' window with event logs and two ads labeled 'Ad title' and 'Ad'. Red arrows point from the text labels to specific elements in the interface.

- Ad title → Click/hover on title
- Ad title → Click/hover on ad
- Ad title → Click/hover on button
- Score 25 → Impression score

Current situation

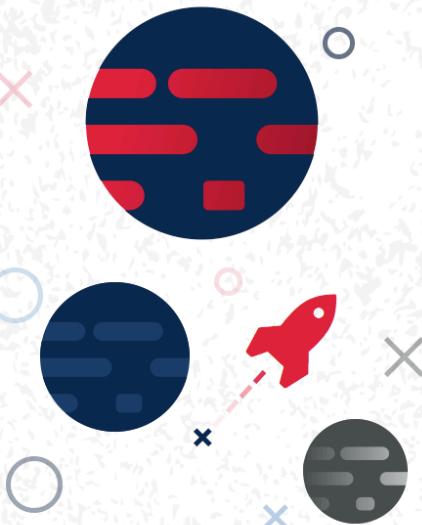


Do you want to see it with your own eyes?
View our prototype on honor.herokuapp.com

MongoDB database



- ✓ Store identifier (e.g. button ID)
- ✓ Store user and session ID
- ✓ Relative position (coordinates)
- ✓ Speed mouse pointer



Internal Communication and Information Flows in Startups & Scaleups

What changes occur in the internal communication & information flows of leaders as startups progress through stages of growth?

With the current trend of having an increasing number of startups, both in The Netherlands as Europe as a whole, startups have become an interesting area of research for a variety of institutes. However, despite the vast amount of research and courses available in this topic about 90% of startups are unable to make the transition into maturity. That is why this study investigates the effect leaders can have on helping startups grow beyond the initial start up phase. In particular, the focus is on communication since prior research considers communication as an influencing factor for all leadership constructs (Tamara et al., 2009).



Methodology

The aim of this study is to reflect on the differences and similarities with regards to our research question between a theoretical (literature) and practical (interviews) perspective. Given the very specific scope, interviewees have been selected based on the following criteria:

Data Selection Criteria

- Working for a (former) start-up
- Involved in the start-up since its establishment
- In charge of at least 5 other employees

Data Collection

Three semi-structured interviews have been conducted among: Bertrand Laborde, Rick Pastoor and Edwin Hermekens. Each interview design contains both a generic and person specific part. The former serves to cross-validate empirical findings, whereas the latter is aimed at discovery of specific communication and information flow procedures.

Data Analysis

After the data collection, interviews have been transcribed. These transcripts form the basis of the empirical results.



Interviewees

Bertrand Laborde - StudyPortals

"The fact that we try to strengthen our leadership team shows that it is a constant challenge."



Rick Pastoor - Blendle

"It is a matter of repeating until you could ask anyone: what direction are we heading and you get the same answer every single time."



Edwin Hermekens - Medapp

"Productivity has more than doubled since employees know 'why' they are doing things."



Empirical Findings

Leader Skills & Mission

In the early stages, founders play the role of hands-on visionary, especially since there is little user data to support decision-making. During scale up, founders become facilitators who communicate the "why" instead of the "how". Entrepreneurs who develop bonding networks from frequent interaction accrue high levels of relational trust and positive expectations (Anderson et al., 2007). In addition Reveley et al. (2004) observed that face-to-face communication is essential for conveying beliefs and perceptions.

Leader/Team Exchange

In the early stages, small teams allow founders to communicate their vision directly. During scale up, management teams play an active role in the internal vision & goal setting. The main challenge, however, is to involve the right people in the decision-making process. This in accordance with Ensley et al. (2006), who showed that leadership appears to be especially important in the development and growth of startups.

Leader Structuring

In the early stages, separate teams worked fine in horizontal organisational structure as long as intercommunication between teams was inessential. Scale-ups however, had to limit team size to avoid a overgrowth of communication lines. Lawler (1986) already described the trend towards flat hierarchical structures with high-involvement management. Ensley et al. (2006) noticed that both shared and vertical leadership affected new venture's performance.

Team Network

Company growth is often associated with international expansion. Although it can create opportunities for recruiting new talent abroad it also comes with the challenge of keeping everyone up-to-date. In some cases it may even be recommended flying in hires for temporary in-house training.

Immediate and Long-Term Outcomes

In the early stages, communication of goals was not always a priority. This resulted in colleagues often not knowing where the company was heading to. During scale-up, strategy plans were formalized. This included company vision, KPIs and yearly goals. In addition, multiple channels to communicate these plans were used, such as OKR, e-mail and all-hands sessions. The challenge however was to communicate these plans such that KPIs are not blindly optimized.



Practical Implications

What does not change as startups progress through different stages of growth, but turns out to be very important is repeating the company vision and motivating employees by a shared goal. Although it increases efficiency among employees, it is often overlooked at the initial startup phase.

Another challenge is optimizing on a global rather than a local level. An one-page strategy plan with overarching KPIs and face-to-face company meetings (e.g. all-hands) can support this. In addition, methodologies such as OKR provide your employees with freedom and ownership which is crucial.

On the other hand, company growth requires a changing attitude and organizational structure. Leaders take on a more coaching role and additional management layers are added to improve vertical leadership.

References

Anderson, A., Park, J. and Jack, S. (2007) 'Entrepreneurial Social Capital: Conceptualizing Social Capital in New High-Tech Firms', International Small Business Journal 25(3):245-72.

Chen, J., & Thompson, P. (2015). New Firm Performance and the Replacement of Founder-CEOs. Strategic Entrepreneurship Journal, 9(3), 243-262. doi:10.1002/sej.1203

Ensley, M. D., Hmieleski, K. M., & Pearce, C. L. (2006). The importance of vertical and shared leadership within new venture top management teams: Implications for the performance of startups. The Leadership Quarterly, 17(3), 217-231. doi:10.1016/j.lequa.2006.02.002

Friedrich, T. L., Vessely, W. B., Schuelke, M. J., Ruark, G. A., & Mumford, M. D. (2009). A framework for understanding collective leadership: The selective utilization of leader and team expertise within networks. The Leadership Quarterly, 20(6), 933-958. https://doi.org/10.1016/j.lequa.2009.09.008

Reveley, J., Down, S. and Taylor, S. (2004) 'Beyond the Boundaries: An Ethnographic Analysis of Spatially Diffuse Control in a Small Firm', International Small Business Journal 22(4): 349-67.

Some final tips!

- FontAwesome - <https://fontawesome.com>
- Stick to one color palette (i.e. no rainbows)
- Same principle for the fonts!
- Inspiration: Google/Pinterest/Dribbble is your friend!
- But... focus on **content first!**

Developing and characterising a novel combined nanoelectrode system

L. P. Robinson, A. Mount



Electrochemistry at nanoelectrodes

Nanoelectrodes have several advantages for electrochemical sensing.



Transport to macroelectrodes proceeds through a relatively inefficient linear diffusion profile. They are also highly affected by convection and IR drop.

In contrast, the diffusion pattern for nanoelectrodes quickly becomes hemispherical. This profile is much more efficient, and they are not so affected by convection or IR drop. They can reliably detect very low (attomole) concentrations of analyte.

A Pt microsquare nanoband edge electrode (MNEE) array system in which the Pt nanoband acts as the working electrode has been developed. The project now aims to create a nanoelectrode device based on this system which has all three electrodes necessary for analysis on one chip.

Fabrication

This design has been fabricated at the Scottish Microelectronics Centre using photolithography. In this technique layers of metal and insulator are deposited and patterned to produce the desired arrangement.



1. Si wafer with oxide surface
2. Metal is then deposited and coated in a nitride passivation layer

WHAT MAKES AN EFFECTIVE WEB PAGE: THE BYU-IDAHO ADMISSIONS OFFICE

ABSTRACT

The Admissions Office has recently updated their website to try and make things easier to find for students. Their main concern was that prospective and new students be able to locate answers to their questions quickly and easily. Depth interviews were set up with ten freshman students to discuss how easily they could navigate the site. Each student was placed in front of a laptop with the Admissions webpage up and given a series of scenarios in order to determine how difficult navigating around the website was. Interviewers recorded the time and number of steps taken to find each answer. Video and screen capture was taken of the individual interviews.

One of the most difficult tasks for students to complete was finding the home schooled student application requirements and missionary deferment information. The difficulty the students found in some of these scenarios could be attributed to their assumptions that all answers could be found simply by reading the various links on the navigation bar.

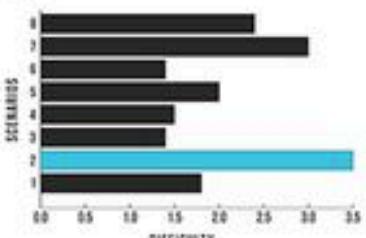
METHODS

This research required depth interviews. First, a list of randomly selected freshman was provided including their first and last name, phone number and email. The day before each session, students off the list were called to ask to participate. Only 2 responded in the affirmative, so it was decided that convenience sampling was the next best option. The sessions were located in a crowded building, so participants were gathered on the spot. They were led to the room and were placed in front of a laptop open to the BYU-Idaho Admissions Office webpage. The gender and age of the student were noted. Depth interviews were conducted 2 at a time. They were verbally given a series of scenarios pertaining to finding information using the Admissions Office website.

The students were timed for how long they took for each scenario and tallied for the number of steps (click) it took them. Students were asked how difficult each scenario was and the interviewers recorded the responses from the freshman. The answers were measured on a numerical scale from 1 to 5 with 1 being very easy and 5 being very difficult.

FINDING 1

One of the most difficult tasks for students to complete was Scenario 2 which required students to find the home schooled student application requirements and averaged 3.5 in difficulty on a scale of 1 to 5.



FINDING 2

While students had been prompted to navigate the admissions website using the menu, 8 out of 10 students said they were more likely to use the search bar to find answers than to use the links.



FINDING 3

On average, students had trouble finding the list of majors using the Admissions page. The average number of steps students clicked before finding the list of majors was 4.9.



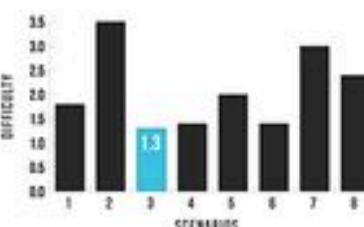
FINDING 4

Students found it easy to find off-track education options and averaged only 37 seconds to find it using the Admissions page.



FINDING 5

One of the easiest pages for participants to find was the application requirement for students who were transferring to BYU-Idaho with more than 24 credits. The average difficulty rating was a 1.3 on a scale of 1 to 5.



FINDING 6

It took students on average 1 more step to find missionary deferment information than the average of all other scenarios.



RECOMMENDATIONS

Students found it easiest to find off-track education options and application requirements for students who were transferring to BYU-Idaho with more than 24 credits. The links to the pages were clearly displayed on the main navigation screen and participants were happy with its simplicity.

Students found the home schooled student application requirements difficult to find. At the start of each depth interview, students were told that all of the answers could be found using the BYU-Idaho Admissions webpage. This may have given students the impression that the answers could be found directly on the home page. When students did not see a home school link in the navigation section of the home page they backed up and used the search bar. The link to the application was in the body copy of the New Freshman page rather than being its own page. The Admissions Office may consider adding home school information as its own separate link.

It also proved challenging to find how to defer for a mission. Nine out of the ten students interviewed thought that the mission deferment should be placed under "missionary programs". They were confused when this link only gave them information about the prospective and returning missionary programs. Every student thought that it would make sense to have information about a mission deferment under this tab as well.

During the depth interviews, 8 out of 10 students were more likely to use the search bar to find answers than to navigate the admissions website. When using the search bar the students had a difficult time finding the correct link. If the answer to the question was not in the top five options shown, the student would not look any further.

One thing that could be done to improve the effectiveness of the site is to know what students are searching for. By having several key words attached to the website, the Admissions Office can better control what pages come up when a student searches certain words. Although a student might not be familiar with vocabulary such as "missionary deferment", they still need to be able to search other key words that would lead them to the correct webpage. Some key words such as, "mission leave" and "admissions hold for mission" could prove useful. By embedding broader key words, this will direct more students to the correct page.



"There is a Devil in my Neighborhood"

The Study of Gambian Spiritual Beliefs and Treatments

Camille Hogan and Deborah A. O'Donnell, PhD
Department of Psychology, St. Mary's College of Maryland



Introduction

Perceptions of illnesses in Africa often revolve around supernatural beliefs and are approached with supernatural treatments. Some of these treatments are known to have negative outcomes. Studies on supernatural treatments regarding specific illnesses being treated as "evil spirits", have reported the lack of knowledge about other treatment methods, or that alternative medical treatments are not accessible to some communities (Coleman, 2002; Mwangome, 2010). Research shows that rural dwelling is associated with greater use of non-medical treatments.

The objective of this study is to measure attitudes and practices regarding supernatural ideas of illness and treatment in a small West African country, The Republic of The Gambia. We examined whether students located in secondary towns were more likely to pursue supernatural treatments for somatic and mental health symptoms than their urban counterparts, and the extent to which use of supernatural treatments relates to mental and physical symptoms.

Methods

The Gambia Social and Health Assessment (G-SAHA) is a survey distributed to high school students in six schools in the Gambia, West Africa located in Banjul, Serrekunda, Essau, Farafenni, and Basse. For the purposes of statistical analysis, schools were divided into secondary towns ($n = 3$ schools) and Greater Banjul Area ($n = 3$ schools) groups, based on their distance from the coastal urban center. The Greater Banjul Area encompasses towns surrounding the capital city of Banjul (see Figure 1).

The survey consists of over 100 questions using a three-point scale for answer selection, ranging from 1 ("very little") to 3 ("very much"). The survey includes questions about the individual's health, and his or her school, family, home, and social environment. Sections containing questions about spiritual and religious beliefs, perceptions about AIDS, somatic symptoms, traumatic stress symptoms, and depression were examined. A series of one way ANOVAs was run comparing students attending schools in the Greater Banjul Area to those in secondary towns on their answers to questions such as, "a spirit or devil exists in my neighborhood," "I visit marabouts or use jus jus for protection," and "I believe that AIDS is a punishment from God". Marabouts are traditional healers; jus jus are protective charms worn as bracelets or necklaces.

Results

Table 1: Spiritual beliefs and practices in secondary towns and the Greater Banjul Area

G-SAHA Item	M (SD)		
	Secondary		Greater Banjul
	Towns	Area	F
I visit marabouts or use jus jus for protection	1.50 (0.62)	1.40 (0.59)	6.28**
A spirit or devil exists in my neighborhood	1.51 (0.68)	1.38 (0.58)	9.57***
I believe AIDS is a punishment from God	2.32 (0.89)	2.23 (0.87)	2.05
I would like to attend an AIDS seminar	2.81 (0.49)	2.87 (0.44)	3.74*

Table 2: Relationship between mental health and visits to marabouts/use of jus jus

G-SAHA Scale	M (SD)		
	Visit Marabouts/ Use Jus Jus		Never Visit Marabouts/ Use Jus Jus
	n = 368	n = 578	F
Depression	25.27 (4.17)	24.27 (4.54)	3.37
Somatic Complaints	9.36 (2.49)	9.37 (2.56)	0.01
Post Traumatic Stress	37.22 (5.94)	35.48 (6.50)	17.24***
Seizures when Worried	1.41 (0.69)	1.34 (0.64)	1.96

*p<.05; **p<.01; ***p<.001



Conclusion

These findings suggest that Gambian youth who live in secondary towns are more likely to possess supernatural beliefs and to practice traditional medicine than their counterparts living in the Greater Banjul Area. Interestingly, an opposite trend was found regarding desire to attend an AIDS seminar. Students who reported having visited a marabout or used jus jus for protection had significantly higher levels of post-traumatic stress than their peers who did not report using traditional treatment approaches.

These preliminary findings open areas for further exploration. It would be interesting to examine students' attitudes about the effects of spiritual treatments, whether non-traditional treatment approaches, including Western medicine, are easily accessible, and how knowledgeable youth are about medical treatment approaches.

Although the HIV/AIDS rate remains low in The Gambia at 1.3%, further exploration into students' beliefs about AIDS and how these beliefs may translate into behaviors is warranted.

References

- Coleman, R., Loppy, L., & Walraven, G. (2002). The treatment gap and primary health care for people with epilepsy in rural Gambia. *Bulletin of the World Health Organization*, 80(5), 378-383.
Mwangome, M., Prentice, A., Plugge, E., & Nweneka, C. (2010). Determinants of appropriate child health and nutrition practices among women in rural Gambia. *Journal of Health, Population, and Nutrition*, 28(2), 167.
Weissberg, R. P., Voyce, C. K., & Kasprow, W. J. (1991). *The social and health assessment*. Yale University Medical School, New Haven.

Acknowledgements

We would like to thank students from the University of The Gambia for collecting data from the schools, and Angie Draheim for printing this poster.

Mapping Marcellus Shale Flowback Water Chemistry

Darin Rockwell
Bucknell University
GIS Summer Intern

Janine Glatthaar, GIS Supervisor
Carl Kirby, Research Advisor

1. Introduction

The Marcellus Shale natural gas extraction process is undergoing rapid development, which raises many environmental questions. This project studies the chemistry of flowback water. High salinity levels, radioactive elements, and toxic trace metals are found at very high concentrations in the flowback water. However, the concentrations of the measured parameters vary spatially. Professor Kirby and his students previously gathered data on flow-back water and compiled the information into a spreadsheet. My role in this project was to 1) compile additional data, 2) check all data for accuracy and missing information, and 3) create maps that showed the spatial distribution of the selected parameters.

Project data includes well pad location, company name, permit numbers, date of drilling, and selected chemical parameter data from several sources. Data were transferred from Excel™ into ArcMap™ and I experimented with various layouts to produce maps following good cartographic principles. Final maps include contour maps, which were calculated using Inverse Distance Weighted Interpolation, overlaid with graduated symbols for values of nine parameters; Gross Alpha radiation, radium-228, barium, strontium, sodium, and chloride are displayed here.

2. GIS Methods

- Checked data in Excel Spreadsheet with 26R Forms** (Fig. 1,2)
- Input additional data from New York Times Article
- Georeferenced—Marcellus Shale Coalition data to obtain Lat,Long coordinates (Fig. 3)
- Retrieved spud dates**, coordinates, and additional data in order to complete an excel spreadsheet that contains all of the data to be used in ArcGIS 9.3.
- Created ArcShapefile from ArcCatalog from the main excel spreadsheet
- Edited a polyline extent for each of the parameters to be mapped by using the Marcellus Shale polyline extent and data extent (Fig. 4)
- Selected the data that contains only 90 day production flowback** water
- Calculated an Inverse Distance Weighting Interpolation** for each of the parameters by only using data that is from 90 day production flowback** water (see map examples)
- Added another copy of the data in order to overlay graduated symbols** with the Inverse Distance Weighted Interpolation**
- Calculated statistics for each of the parameters to be included on each of the mapped parameters. (See map examples)
- Decided how to best represent the data (graduated symbols, interpolation, or interpolation with overlay of graduated symbols)
- Decided color schemes, map layout, number of breaks in contours, and coordinate system
- Created final map examples for each of the parameters

**Refer to definitions (3)

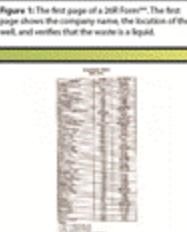


Figure 1: The first page of a 26R Form™. The first page shows the company name, the location of the well, and verifies that the water is a liquid.

Figure 2: Sample table from 26R form that shows an analysis. Each 26R form was entered into the Excel spreadsheet.

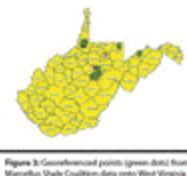


Figure 3: Georeferenced points (green dots) from Marcellus Shale Coalition data onto West Virginia state map.

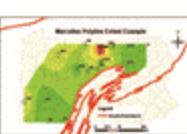


Figure 4: Example Marcellus polyline example. The red shaded area is red shows the extent that the data had to be clipped in order to avoid extrapolation beyond datum.

3. Definitions

- 26R Form: A form that each company is mandated to be sent to DEP annually that includes a chemical analysis of the residual waste produced at a site
- Flowback Water: Water that returns to the surface at the well head after fracking
- Spud Date: The start of drilling on a well
- Georeferencing: Defining spatial reference by location in terms of projections and coordinate systems
- Inverse Distance Weighted Interpolation: predicting unknown values using the known values at certain locations using GIS
- Graduated symbols: A way to represent data that includes proportionate symbols according to break values in the data
- MCL: Maximum Contaminant Level: The highest level of a contaminant that EPA allows in drinking water. MCLs ensure that drinking water does not pose either a short-term or long-term health risk. EPA sets MCLs at levels that are economically and technologically feasible.

4. Map Examples

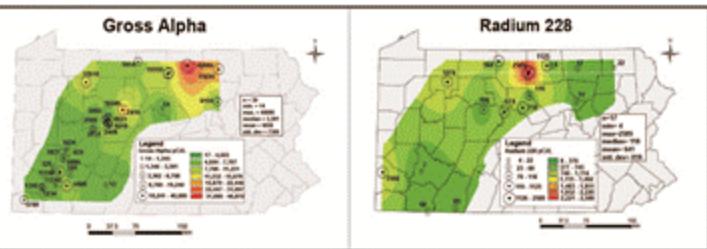


Figure 5 & 6: The left analysis for Gross Alpha identifies all alpha radiation from all radionuclides. It does not determine what radionuclide produced the alpha radiation. E.g., radon is a gas with a short half-life that can escape a solution and likely be less harmful than other forms of radiation. However, radionuclides of radium can be dissolved, adsorbed, or incorporated into solids, and radium has a longer half-life and thus can be a more significant environmental problem (Kirby, 2011).

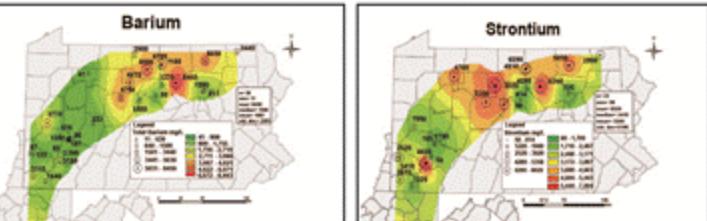


Figure 7: Barium forms a divalent cation, which has relatively higher attraction to other ions in solution, thus it is relatively easier compared to sodium to get barium to precipitate as a solid during treatment (Kirby, 2011). The National Primary Drinking Water Regulations mandate an MCL of 2 mg/L (EPA, 2009). Barium in flowback commonly far exceeds the MCL.

Figure 8: Strontium forms a divalent cation, which has relatively higher attraction to other ions in solution, thus it is relatively easier compared to sodium to get strontium to precipitate as a solid during treatment (Kirby, 2011). Strontium has no MCL. Stable isotopes of strontium may aid in "fingerprinting" Marcellus flowback water "seals" (Kirby, 2011).



Figure 9: Sodium forms a monovalent cation, which has relatively lower attraction to other ions in solution, thus it is difficult to get sodium to precipitate as a solid during treatment (Kirby, 2011).

Figure 10: Chloride forms a monovalent anion, which has relatively lower attraction to other ions in solution, thus it is difficult to get chloride to precipitate as a solid during treatment (Kirby, 2011).

5. References Cited

- Kirby, Carl S., 2011, Personal Communication, Bucknell University, Lewisburg, PA.
Pennsylvania Department of Environmental Protection. 2011, "Permit & Rig Activity Report". <http://www.dep.state.pa.us/dep/deputate/minres/oilgas/RIG11.htm>, accessed 26 July 2011.
US Environmental Protection Agency. "Drinking Water Glossary". <http://water.epa.gov/drink/resources/glossary.cfm#link>, accessed 26 July 2011.

Help! 😕 What am I supposed to do?

1. Lab Exercises DMM
2. Programming Exercises DMM
3. Theory Exercises DMM
4. Graded Assignment 1 (Notebook / Poster)

Or... have a look at the YouTube videos posted on AllAnswers



YouTube Videos Data Visualization (matplotlib)

5 views



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You might find these two YouTube playlists about matplotlib beneficial while creating the visualizations for your poster: [codebasics \(0.75 hours\)](#) and [Max Schallwig \(1.5 hours\)](#)

Good luck!

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