What is the purpose of science? Who fund science and why? Is science currently built and operating in a way that fulfills and reinforces its mission? Why do we do science? How can we measure the quality of a research? Of a scientist? Can we believe scientific findings published in the literature? The scientific method is based on theories that should be tested with empirical tests attempting to refute them. Results of experiments should be tested with statistical tests that are supposed to lead to reliable findings. But is it the case in reality?

“If you don’t have doubts, you haven’t been paying attention”.

During the last years, there is a rising awareness of the need to change and develop the scientific standards and methods. The lack of consistency between rewards and promotions and the goal of science is being emphasized over and over again, and many questions arise. Many projects are conducted to test if prominent scientific findings across various fields can be replicated. The results of this projects are raising concerns that there are major problems with science as it is conducted nowadays. The need for replications, sharing data, codes and protocols, conducting rigorous studies and being transparent is being raised and discussed again and again. At the same time, with the rise of the social media, the publication model of scientific findings is being questioned and changed, and scientific findings are transferring to open platforms.

In this course, we will focus on the principals of critical thinking. We will demonstrate and discuss issues from different scientific fields. We will learn on solutions that are already implemented in practice, such as pre-registration and open science, in order to promote transparency and raise standards. We will also discuss biased media coverage of scientific findings, science in the open social media and different models of open science.

The goal of this course is to raise awareness and knowledge of the above-mentioned topics, develop discussions in class and encourage independent and critical thinking.


نموذج קצר של המסרים המרכזים של הקורס: Discuss issues from different scientific fields. We will learn on solutions that are already implemented in practice, such as pre-registration and open science, in order to promote transparency and raise standards. We will also discuss biased media coverage of scientific findings, science in the open social media and different models of open science.

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If you don’t have doubts, you haven’t been paying attention.

The human understanding, once it has adopted opinions, either because they were already accepted and believed, or because it likes them, draws everything else to support and agree with them. And though it may meet a greater number and weight of contrary instances, it will, with great and harmful prejudice, ignore or condemn or exclude them by introducing some distinction, in order that the authority of those earlier assumptions may remain intact and unharmed.

–Francis Bacon, Novum Organum, 1620

The scope of the course: 180 hours (3 hours per week) in semester 1.

Requirements (student responsibilities):

1. Reading and observation is required for all lectures. In addition, anyone interested may also receive materials for most of the topics.
2. In every lecture 1-3 students will present for a quarter to half an hour a reading assignment in the lecture, to present and discuss it. Every student must present in the course (excluding the lecture on public relations, where everyone presents).
3. To prepare for the lecture on public relations, the students must search for articles in scientific journals and newspapers (for example, New York Times, Ynet, Haaretz, Maariv, Israel Today) and present to the class the difference between the original findings and how they are presented in the mass media. The groups will compete with each other, and the group that finds the greatest difference receives additional 2 points at the end of the course.
4. After the lecture on pre-registration, every student must complete a basic form of pre-registration for one of the relevant researchers, for the purposes of practice.
5. Final work: in pairs/trios. Until 3 pages in English will be presented at the end of the exams. Choose a problem in the scientific process and discuss possible solutions. The problem or at least one of the solutions must be something that was not directly taught in the course, or seen at a different angle.

The students/must participate in the lectures.
### Reading/watching

<table>
<thead>
<tr>
<th>topic</th>
<th>1 Science- what is it, what is it for (introduction to the course)</th>
<th>Optional:</th>
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|       | 1) Oliver: https://www.youtube.com/watch?v=0Rnq1NpHdmw  
2) http://calteches.library.caltech.edu/51/2/CargoCult.htm  
3) bad science: https://www.ted.com/talks/ben_goldacre_battling_bad_science#t-840317 |            |

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3) The non-scientific nature of impact factors: http://journals.plos.org/plosmedicine/article?id=10.1371/journal.pmed.0030291 |

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2) http://journals.sagepub.com/doi/abs/10.1258/jrsm.2008.080062  
3) https://www.ncbi.nlm.nih.gov/pmc/articles/PMC3970754/  
4) http://bjoern.brembs.net/category/science/politics/page/2/  
5) https://www.theguardian.com/commentisfree/2013/dec/09/how-journals-nature-science-cell-damage-science  
7) Impact, not impact factor: http://www.pnas.org/content/112/26/7875.long |

| mandatory: |
2) Cancer:  

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<tbody>
<tr>
<td>1) Munafò, M. R., &amp; Smith, G. D. (2018). Robust research needs many lines of...</td>
</tr>
<tr>
<td>Evidence</td>
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<td>3) Database of replication attempts in cancer: <a href="https://elifesciences.org/collections/9b1e83d1/reproducibility-project-cancerbiology">https://elifesciences.org/collections/9b1e83d1/reproducibility-project-cancerbiology</a></td>
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<tr>
<td>4) how much can we rely on published data on potential drug targets? <a href="http://www.nature.com/nrd/journal/v10/n9/full/nrd3439-c1.html">http://www.nature.com/nrd/journal/v10/n9/full/nrd3439-c1.html</a></td>
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<tr>
<td>2) Gelman, A., &amp; Loken, E. (2013). The garden of forking paths: Why multiple comparisons can be a problem, even when there is no “fishing expedition” or “p-hacking” and the research hypothesis was posited ahead of time. Department of Statistics, Columbia University.</td>
<td></td>
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<th>Evidence</th>
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2) Retraction watch: https://retractionwatch.com/  
Optional:  
2) A code of ethics to get scientists talking: https://www.nature.com/articles/d41586-018-02516-x?WT.ec_id=NATURE-20180302&spMailingID=56095976&spUserID=MjA1NTczNDQ0MAS2&spJobID=1360109627&spReportId=MTM2MDEwOTyNwS2  
3) Owning your mistakes: https://www.ncbi.nlm.nih.gov/pmc/articles/PMC4612774/  
| --- | --- |
2) https://cos.io/blog/why-are-we-working-so-hard-open-science-personal-story/  
3) https://svpow.com/2013/01/25/is-it-immoral-to-hide-your-research-behind-a-paywall/ |
|---|---|
→ From the title- "The Ultimate Solution: Opening Data, Materials, and Workflow"  
2) http://blogs.discovermagazine.com/neuroskeptic/2018/08/06/how-accessible-is-psychology-data/?utm_source=dlvr.it&utm_medium=twitter#.W2nJIihKjIV  
Based on:  
3) Gelman, A. (2016). What has happened down here is the winds have changed. Statistical Modeling, Causal Inference, and Social Science blog, 21 Sept. |
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<tr>
<th>11</th>
<th>Publication model and science in open media</th>
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3) Publishing scooped papers:  
3) http://www.talyarkoni.org/blog/2016/10/01/there-is-no-tone-problem-in-psychology/ |
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<th>12</th>
<th>Students' presentations and concluding discussion</th>
</tr>
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</table>
| Optional: | 1) https://www.psychologytoday.com/blog/the-motivated-brain/201709/advice-
grad-students-and-senior-faculty

2) Scientific proof is a myth:

3) fMRI- scanning the horizon:

- baja 30.10.18 מתכימים יום שבתון עקב בחירות לרשויות המקומיות, ולא יתקיים hoje. בחתם

הנה Giảiבימרט,งาม לפי קבוצת שיעור השולחן ומספרי השיעורים בקורסים השונה كو"ג-ל-2.

מענה לשאלות

כלי שיעור כלכלו ככרび שעה עד舷 שהצגנ הקודקוד המרכזיות שהקיראת ולה ForeignKey על המowała
על ידי 3-3 טrowning/c04. ALTER המכ שלושת רבע שעה עד שעה של 3-4, לוסוף ככרבי שעה של סיסcoln הקודקוד
המקורה נבשבע עד ימי הקודקוד להכראה יהודא.הבשוע ושומע בכיסי התשעון, חזק הספורטיביסמוז/of הקבוצת קונטוט (זונוט/שילוש) האמבר/of את הקסמי
התקשורית שלוחה. הקבוצה שטראש את הפקר הגבאי בורה במוטזאיא המדיין על אם להזזת בתקשורית
ההמונימים, תכלב בונג של 2 קדבודות לחיצי הסופי. דסף השיעור עד מספר התוכנות והרשותות לשלושה הברה.
בשוער שלוח שולח שיעור על פרה-גרפרסריצי, תציטי/нятие כ3 סוסדכוןית/זונוגרפ learner-גרפרסריצה לע מתקד.
שהולצ

בשוער האחרון בקורס ייגוס הספורטיביסמוז/of ב bracelets (.pitch של c-5 דין) ואת הנושאים שלחב לפלייקט הסיטה.

שימו לב: ייככה שים בכם השיעורים ובוחורו הקיראת והנושאים ב.timeScale הקורס בחטא להפתתות
ה디ימו, הנושאים שיעלה ביתו ומספרי עדכני בקטנוע.

7. דרישות חק לקורס

8. הנבולה מספרו ההלמידים בקורס

9. העבר הקורס יינות.cb שעה ואחת ישתתיף?

10. הכבוח הסופי

א.杉ג הגופן והשתחות פועלה ביתיה, 50% פרויקט הסופה.

ב. פרסי תקן:

marage.kgフGF: fons neibear: schonberg@post.tau.ac.il
matnrebing-2319@gmail.com

ድ. הפרטים:

Sagol School of Neuroscience, Ramat Aviv, 6997801 Tel Aviv, Israel. Tel. 972-3-6409081, FAX. 972-3-6409136

03-6409136. 03-6409038, 03-6409039, 03-6409081, 03-6409036, 03-6409136, 03-6409036.