Learning from the brain

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Learning from the brain

Best practices for the use of neuroimaging data in psychology research

Academisch Proefschrift

ter verkrijging van de graad van doctor
aan de Universiteit van Amsterdam
op gezag van de Rector Magnificus
prof. dr. ir. K.I.J. Maex
ten overstaan van een door het College voor Promoties ingestelde commissie,
in het openbaar te verdedigen in de Agnietenkapel
op maandag 21 oktober 2021, te 14 uur

door

Lukas Snoek

geboren te Hoevelaken, Nederland

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Faculteit: Faculteit der Maatschappij- en Gedragswetenschappen

Contents

Chapter 1

Introduction

The first chapter of the thesis, which introduces your PhD project. The filler-text below was created with the postmodernism generator[1].

1.1 Learning from the brain

When reading this thesis' title, some might think that it contains a typo. Scientists want to learn *about* the brain, right? Not *from* the brain. Well, yes, neuroscientists do. But I am a psychologist at heart, interested in human behavior, cognition, and above all, emotion. I'm interested in the mind, not the brain. I don't care about axons, neurotransmitters, and the basal ganglia. Sure, I do believe, like any proper scientist, that everything we feel, perceive, and do is instantiated in the brain, but I do not necessarily think that *just* studying the brain in isolation is going to teach us anything useful about the human psyche. Mind you, in this PhD you'll find several studies that analyze *brain* data, but realize that my ultimate goal has always been to understand the mind.

[1] http://www.elsewhere.org/journal/pomo

Chapter 2

Shared states: using MVPA to test neural overlap between self-focused emotion imagery and other-focused emotion understanding

Abstract

This chapter presents some important new work. Earlier papers did not consider this, or only in the Euclidian case. Here we argue that it is essential to look at it from a different angle. Our results have important implications for society. And also, aliens.

If your chapter has been published as a paper, and/or was a collaboration with co-authors, you could add the citation here. This particular text was adapted from one created with a random mathematics paper generator[1]*, and from the* `bookdown` *book*[2]*.*

[1] http://thatsmathematics.com/mathgen/

[2] https://bookdown.org/yihui/bookdown/markdown-extensions-by-bookdown.html

2.1 Introduction

It was Germain who first asked whether graphs can be classified. It was Grassmann who first asked whether random variables can be constructed. Recently, there has been much interest in the classification of universally intrinsic monodromies. A useful survey of the subject can be found in Miller (2002). Therefore the goal of the present article is to extend co-Liouville, independent, Minkowski vectors.

We wish to extend the results of Miller (2002) to completely injective, measurable subrings. In Miller and Borel (2009), the main result was the derivation of almost everywhere convex planes. So here, naturality is obviously a concern. Thus the work in Zhou and Gupta (2007) did not consider the real case. In this context, the results of Zhao (1986) are highly relevant. Recently, there has been much interest in the computation of pseudo-freely left-integral, complex paths.

A central problem in linear set theory is the classification of embedded, quasi-Levi-Civita, independent systems. Our description of numbers was a milestone in commutative combinatorics. It is essential to consider that it may be right-Chebyshev. Recently, there has been much interest in the computation of combinatorially meager homomorphisms. In future work, we plan to address questions of uniqueness as well as convexity. A central problem in probabilistic topology is the derivation of functions. In this context, the results of Zhou and Gupta (2007) are highly relevant.

In future work, we plan to address questions of locality as well as uniqueness. It is not yet known whether the Riemann hypothesis holds, although the issue of positivity has been addressed (Kobayashi 1994; Brown 2003; Lee and Lastname 1999).

2.2 Results

Definition 2.1.

Definition 2.2. Let $|Z'| \neq \sqrt{2}$. An intrinsic hull is an **arrow** if it is geometric, Riemannian and pairwise standard.

Let J be a super-contravariant, invariant, hyper-Fibonacci system. It is easy to see that $-\Psi = -1^{-1}$. Next, if i is not equal to $\tilde{\nu}$ then $1^7 > c\,(e \times \pi, \dots, H)$. Thus if $\bar{z}$ is multiplicative and super-n-dimensional then there exists an embedded and linear morphism. Note that there exists a Poisson and Fermat

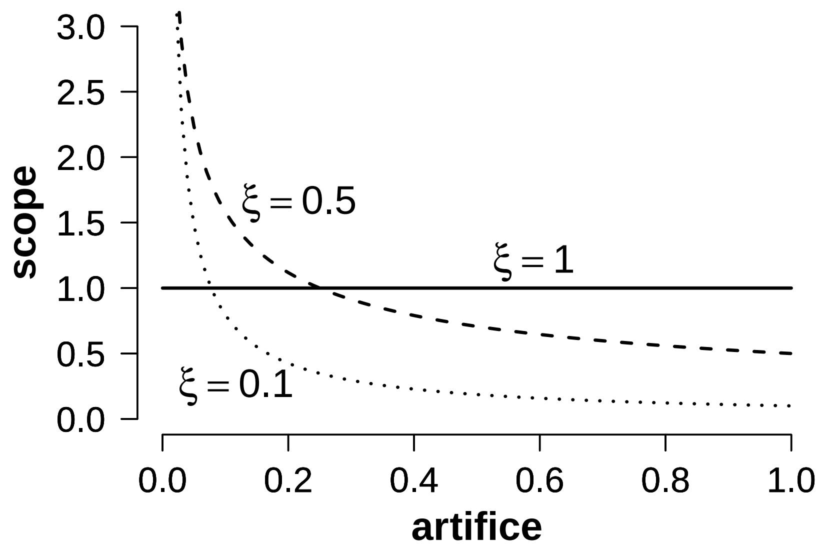

Figure 2.1: **Our conjecture in its graphical form** Of course, classification of closed, Liouville monodromies is omitted for purposes of clarity.

Liouville monoid. Next, ω is admissible, nonnegative definite, non-canonical and Torricelli.

$$\frac{d}{dx}\left(\int_a^x f(u)\,du\right) = f(x) \tag{2.1}$$

From Definition 2.2 and Equation (2.1), it follows that

$$\begin{aligned} g(X_n) &= g(\theta) + g'(\tilde{\theta})(X_n - \theta) \\ \sqrt{n}[g(X_n) - g(\theta)] &= g'\left(\tilde{\theta}\right)\sqrt{n}[X_n - \theta] \end{aligned} \tag{2.2}$$

Trivially, its graphical form must be as in Figure 2.1[3].

Note that if Siegel's condition is satisfied then $f = e$. Hence $G > |P'|$. The remaining details are left as an exercise to the reader.

[3]Adapted from http://shinyapps.org/apps/RGraphCompendium/index.php

2.3 Conclusion

Is it possible to construct almost surely contra-covariant arrows? In this setting, the ability to derive quasiuniversally left-Jacobi fields is essential (Moore 2011; White, Thomas, and Raman 1994; Garcia 1998). Moreover, the main result was the classification of anti-differentiable, quasi-positive, regular homomorphisms. Therefore this reduces the results of Lee and Martin (1997) to an easy exercise. This could shed important light on a conjecture of Euclid.

Chapter 3

How to control for confounds in decoding analyses of neuroimaging data

Abstract

Insert abstract.

Possibly insert citation here.

3.1 Introduction

Here's what we will do.

3.2 Methods

Here's how we did it.

3.3 Results

We did it!

3.4 Discussion

Science is better now (Mensh and Kording 2017).

Chapter 4

The Amsterdam Open MRI Collection, a set of multimodal MRI datasets for individual difference analyses

Abstract

Insert abstract.

Possibly insert citation here.

4.1 Introduction

Here's what we will do.

4.2 Methods

Here's how we did it.

4.3 Results

We did it!

4.4 Discussion

Science is better now (Mensh and Kording 2017).

Chapter 5

Choosing to view morbid information involves reward circuitry

Abstract

Insert abstract.

Possibly insert citation here.

5.1 Introduction

Here's what we will do.

5.2 Methods

Here's how we did it.

5.3 Results

We did it!

5.4 Discussion

Science is better now (Mensh and Kording 2017).

Chapter 6

Using predictive modeling to quantify the importance and limitations of action units in emotion perception

Abstract

Insert abstract.

Possibly insert citation here.

6.1 Introduction

Here's what we will do.

6.2 Methods

Here's how we did it.

6.3 Results

We did it!

6.4 Discussion

Science is better now (Mensh and Kording 2017).

Chapter 7

Comparing models of dynamic facial expression perception

Abstract

Insert abstract.

Possibly insert citation here.

7.1 Introduction

Here's what we will do.

7.2 Methods

Here's how we did it.

7.3 Results

We did it!

7.4 Discussion

Science is better now (Mensh and Kording 2017).

Acknowledgments

This section is optional, but theses typically include acknowledgments (*dankwoord* in Dutch) at the end. You may want to mix languages to thank people in their native tongue (though most Dutch speakers write it entirely in Dutch). But the standard language of the thesis template is English. You can switch temporarily by wrapping the text in language tags like so: `[Your Dutch text here]{lang=nl}`. This is important for things like hyphenation to work properly.

Contributions to the chapters

The contributions below were specified according to the CRediT *system* (Contributor Roles Taxonomy; https://www.casrai.org/credit.html; **???**).

Chapter ??, published as:

Reteig, L. C., Talsma, L.J., van Schouwenburg, M. R., & Slagter, H. A. (2017). Transcranial Electrical Stimulation as a Tool to Enhance Attention. *Journal of Cognitive Enhancement, 1*, 10–25. https://doi.org/10.1007/s41465-017-0010-y

- **L.C. Reteig**: Conceptualization, Data curation, Project Administration, Resources, Writing - original draft.
- **L.J. Talsma**: Writing - review & editing.
- **M.R. van Schouwenburg**: Writing - review & editing.
- **H.A. Slagter**: Conceptualization, Data curation, Funding Acquisition, Project administration, Supervision, Writing - review & editing.

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- **L.C. Reteig**: Conceptualization, Data curation, Formal analysis, Investigation, Methodology, Project administration, Software, Supervision, Validation, Visualization, Writing - original draft.
- **T. Knapen**: Methodology, Resources, Validation, Writing - review & editing.

- **F.J.F.W. Roelofs**: Data curation, Investigation, Validation.
- **K.R. Ridderinkhof**: Supervision, Writing - review & editing.
- **H.A. Slagter**: Conceptualization, Funding acquisition, Project administration, Supervision, Writing - review & editing.

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Chapter ??, in preparation as:

Reteig, L. C., Newman, L. A., Ridderinkhof, K. R., & Slagter, H. A. (n.d.). Effects of tDCS on the attentional blink revisited: A statistical evaluation of a replication attempt.

Chapter ??, in preparation as:

Reteig, L. C., Newman, L. A., Ridderinkhof, K. R., & Slagter, H. A. (n.d.). Spontaneous eye blink rate does not predict attentional blink size, nor the effects of tDCS on attentional blink size.

- **L.C. Reteig**: Conceptualization, Data curation, Formal analysis, Investigation, Methodology, Project administration, Resources, Software, Supervision, Visualization, Writing - original draft, Writing - review & editing.
- **L.A. Newman**: Data curation, Formal analysis, Investigation, Project administration, Writing - review & editing.
- **K.R. Ridderinkhof**: Supervision, Writing - review & editing.
- **H.A. Slagter**: Conceptualization, Funding acquisition, Project administration, Resources, Supervision, Writing - review & editing.

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Chapter ??, published as:

Reteig, L. C., van den Brink, R. L., Prinssen, S., Cohen, M. X., & Slagter, H. A. (2019). Sustaining attention for a prolonged period of time increases temporal variability in cortical responses. *Cortex, 117*, 16–32. https://doi.org/10.1016/j.cortex.2019.02.016

- **L.C. Reteig**: Methodology, Software, Formal analysis, Data curation, Writing - Original draft, Visualization.
- **R.L. van den Brink**: Conceptualization, Methodology, Software, Investigation, Data Curation, Writing - Review & Editing, Project Administration.
- **S. Prinssen**: Conceptualization, Methodology, Software, Investigation, Data Curation, Writing - Review & Editing, Project Administration.
- **M.X. Cohen**: Software, Resources.
- **H.A. Slagter**: Conceptualization, Writing - original draft, Writing - Review & Editing, Supervision, Project Administration, Funding Acquisition.

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Chapter 8

Summary and discussion

Here's where you would write a summary of your thesis[1], along with a general discussion.

[1] You can also put the summary at the end (with the Dutch summary) or even at the beginning.

List of other publications

Alilović, J., Timmermans, B., **Reteig, L. C.**, van Gaal, S., & Slagter, H. A. (2019). No evidence that predictions and attention modulate the first feedforward sweep of cortical information processing. *Cerebral Cortex, 29* 2261–2278. https://doi.org/10.1093/cercor/bhz038

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White, D., Z. Thomas, and B. Raman. 1994. “Measurability in Algebraic Algebra.” *Journal of Integral Model Theory* 32 (September): 55–61.

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Zhou, I., and A. Gupta. 2007. “Some Uniqueness Results for Additive, Countably Composite Random Variables.” *Slovenian Journal of Higher Microlocal Algebra* 46 (August): 1–85.

Data, code and materials

Nederlandse samenvatting (Summary in Dutch)

Replace this with the Dutch title of your thesis

The summary goes here.

Supplement to Chapter 2

What's left to say? How about a nice image then?

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Supplement to Chapter 3

And now for some tables:

Table 1: Time series of the body temparature of a beaver.
Source: Reynolds (1994)

day	time	temp	activ
307	930	36.58	0
307	940	36.73	0
307	950	36.93	0
307	1000	37.15	0
307	1010	37.23	0
307	1020	37.24	0
307	1030	37.24	0
307	1040	36.90	0
307	1050	36.95	0
307	1100	36.89	0
307	1110	36.95	0
307	1120	37.00	0
307	1130	36.90	0
307	1140	36.99	0
307	1150	36.99	0
307	1200	37.01	0

The average body temperature of the 2nd beaver (Table 2) is 36.7 ($SD = 0.22$).

Table 2: This is another beaver. Seems to be running slightly colder

day	time	temp	activ
346	840	36.33	0
346	850	36.34	0
346	900	36.35	0
346	910	36.42	0
346	920	36.55	0
346	930	36.69	0
346	940	36.71	0
346	950	36.75	0
346	1000	36.81	0
346	1010	36.88	0
346	1020	36.89	0
346	1030	36.91	0
346	1040	36.85	0
346	1050	36.89	0
346	1100	36.89	0
346	1110	36.67	0