Success stories

- Paper published
  - **MacInnes** W., Bhatnagar R. No supplementary evidence of attention to a spatial cue when saccadic facilitation is absent // Scientific Reports. 2018. Vol. 8. No. 1. P. 13289-1 -13289-13.
- Working papers
  - Krasovskaya, Zhulikov & MacInnes. Deep Learning Neural Networks as a Model of Saccadic Generation. Status: Preprint, in preparation.
  - Malevich Blagovechtchenski, Iscan, Nikulin & MacInnes. Neuronal dynamics in the alpha-band oscillations during an exogenous orienting task. Status: Rejected and rewriting
  - Merzon, Zhulikov, Krasovskaya, Malevich & MacInnes. Temporal Limitations of the Standard Leaky Integrate and Fire Model. Status: Under review – Cognitive Computation
- Conference abstracts
  - ECVP - 2018
- Advanced eye tracking workshop
- …

Currently waiting on

- COSYNE 2019
  - Unfortunately, all rejected
  - They now want fully completed research (no more student posters)
  - Some useful reviews, some less knowledgeable about our area (look at the certainty score)
- Europe Psychology Congress
  - July 3, Moscow
  - Large Symposium with Klein, Bisley and Bourgious
  - Multiple abstracts
- Estes competition for computational neuroscience workshop
  - June 28th?

Other options

- **ECEM**
  - **Sunday, August 18th, to Thursday, August 22nd, in Alicante, Spain**
  - **Deadline April 5th**
- Psychonomics
  - November 14-17, 2019, Montreal, Quebec, Canada
  - One member paper, one sponsored student paper, other options??
  - Deadline ?? (opens in April, no closing date)
- NeuroIPS (formerly NIPS)
  - We will not attend as a group, since tickets are practically impossible
  - Individuals may submit with 'exceptional' results
- International Conference on Predictive Vision, (ICVP) Toronto
  - June 10th
  - Only if one or both of July options are rejected
- Symposium on Cognitive and Motor Processes in Spatial Attention
  - Durham, July 11/12
  - Exceptional speaker list!
  - Only if both of July options are rejected

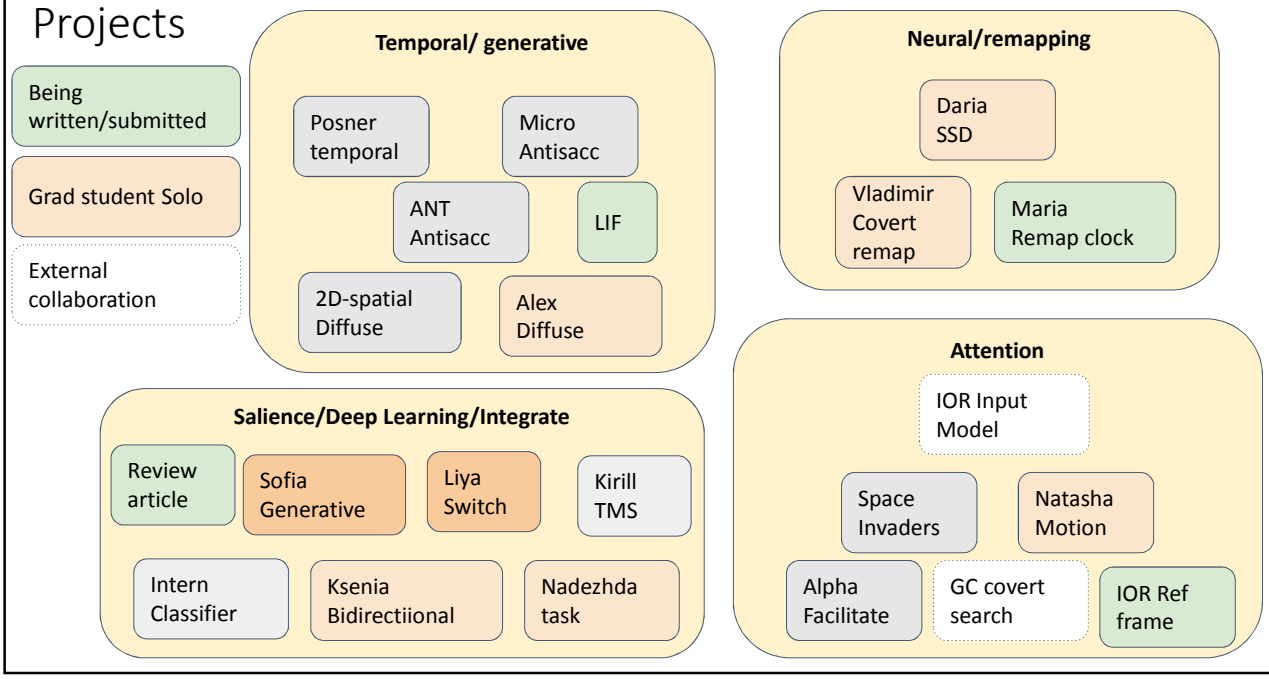
Talks

- Jan 18th
  - Me
- Feb 1st
  - Alex: Diffusion results
- Feb 15th
  - Georgii and classifier interns. Update
- March 1st
  - Ksenia K: Space invaders
- March 15th
  - Sofia : Microsaccade results
- March 29th
  - Joe Covert attention and mouse contingent
- April 12th
  - 1st year masters practice?
- April 26th
  - 2nd year masters practice

Tanya: Generalized additive models
Maybe a full day event on new statistics methods?

One day for 2nd year masters practice
One day for 1st years masters practice

Projects



Early Salience

Review Article (Sofia, Liya)

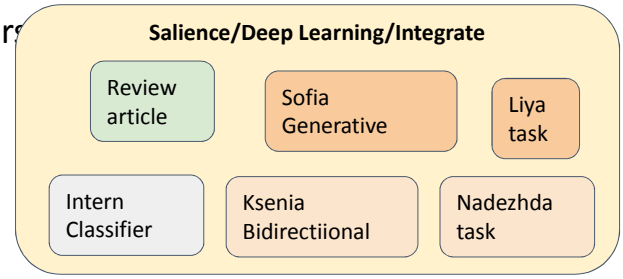
Generative Model (Sofia - PhD)

Task, Individual differences (Liya - PhD)

Task, change blindness (Nadezhda, Liya)

Bidirectional classifier (Ksenia - Master

Classifier (Georgii, Interns)



Attention

IOR Input Model (Joe, RJ, Ray)

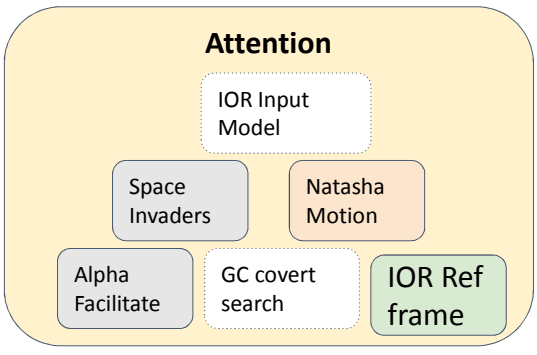
GC Covert Search (Joe, Arni, Omar, Andrey)

Space Invaders (Ksenia K., Tanya, Alena)

IOR Reference Frame (Tanya, +External)

Alpha Response (Tanya, Vadim, +External)

Motion feedback (Natasha - masters)



Oculomotor temporal generation

LIF (Liya, Georgii, Sofia, submitted)

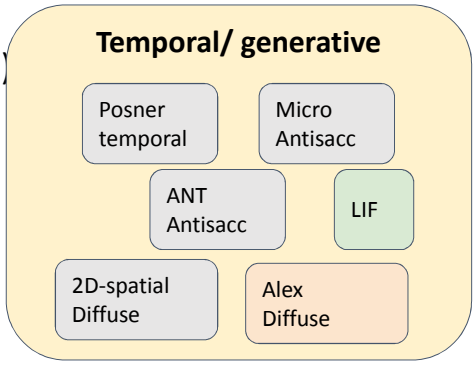
2d spatial diffusion (Georgii, Liya, Ivan, Sofia)

Rescorla diffuse (Alex)

Posner II: salience diffuse (Lena, Tanya, Anastasia)

Micro Antisaccade (Sofia, Arni)

Sacc-ANT (Lena, Alena)

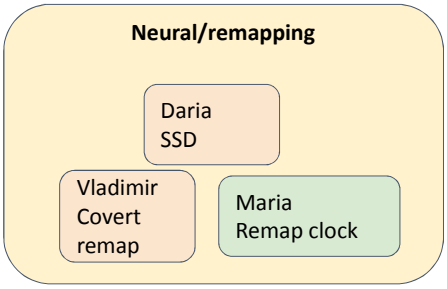


Neural Remapping

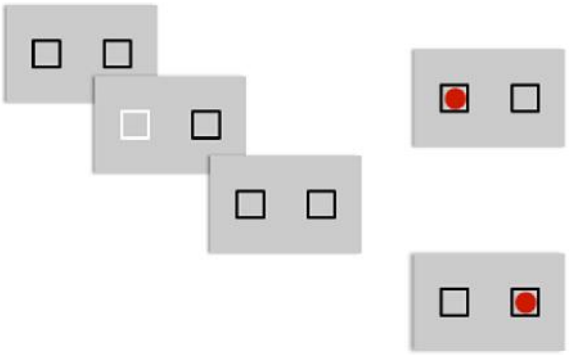
Saccadic suppression of displacement (Daria, Katya? Amelia?)

Search covert remapping (Vladimir)

Remap Clock (Maria E., Roopali)

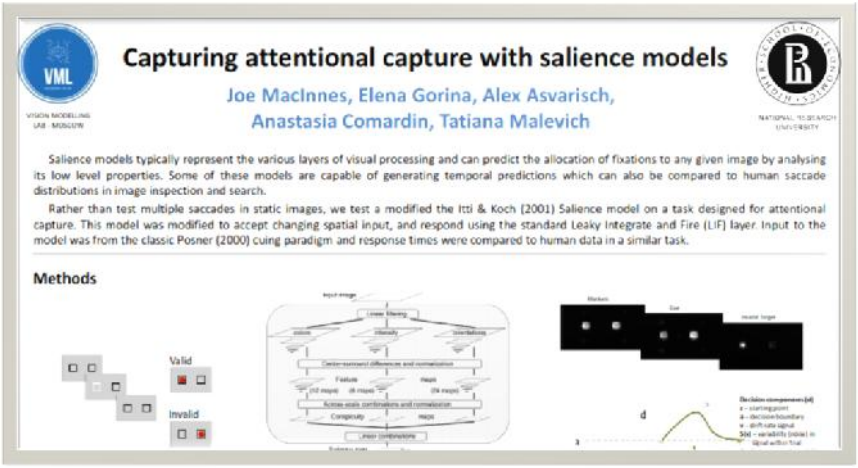


Posner Cuing task



Posner group update

- Stage 1 Completed and presented
- Diffusion model makes specific predictions on three theories of attention



Capturing attentional capture with salience models

Joe MacInnes, Elena Gorina, Alex Asvarisch, Anastasia Comardin, Tatiana Malevich

Salience models typically represent the various layers of visual processing and can predict the allocation of fixations to any given image by analysing its low level properties. Some of these models are capable of generating temporal predictions which can also be compared to human saccade distributions in image inspection and search.

Rather than test multiple saccades in static images, we test a modified the Itti & Koch (2001) Salience model on a task designed for attentional capture. This model was modified to accept changing spatial input, and respond using the standard Leaky Integrate and Fire (LIF) layer. Input to the model was from the classic Posner (2000) cuing paradigm and response times were compared to human data in a similar task.

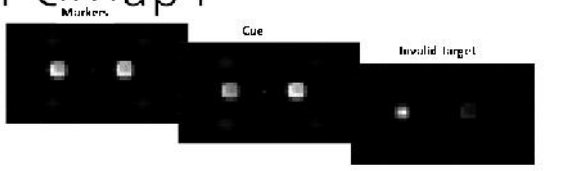
Methods

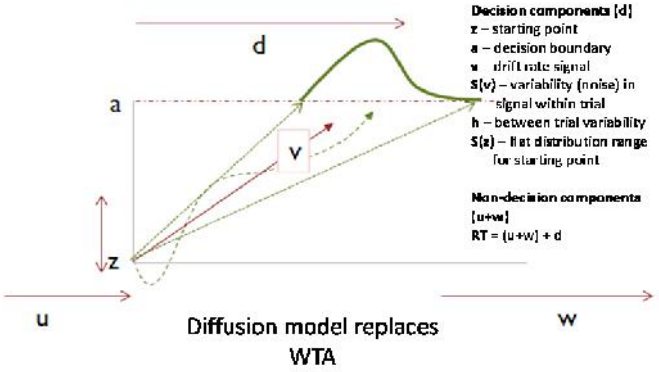
Summary of results

	Facilitation?	IOR?	Theory?	CTOA	Modality
Kruger et al, 2014	Yes	--	Perceptual Merging	Short	Simple button
MacInnes, 2017	No	Yes	Gradient	Random	Simple Button & Saccadic
MacInnes & Bhatnagar, 2018	No	Yes		Random	Saccadic
Malevich (in prep)	Yes	--	Response inhibition	Short	Simple Button
Malevich et al, 2018 (I,II,III)	No	Yes	--	**Random**	Simple Button
Malevich et al, 2018 (IV)	Yes	Yes	Attention?	**Block Short/Long**	Simple Button

Salience Diffuse: Posner Group I

- Feed salience model into Diffusion
- Salience values could impact
  - Different parameters
  - At different times
- Based on three theories of attentional facilitation





Diffusion model replaces WTA

- **'Salience rate'**

- Drift rate is calculated from **trial onset**
- Drift value is calculated as **salience difference** of locations
- Negative values (such as invalid cue) can lead to 'negative' accumulation toward incorrect threshold

- **'Threshold bias'**

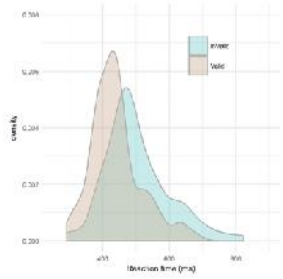
- Drift rate is 0 until **target onset**
- Bias parameter is modified at the time of the cue onset
- Value of the change depends of **salience difference** (valid-invalid)

- **'Speeded attention'**

- Drift rate is 0 until **target onset**
- Value of the drift rate is adjusted by **proportional salience** and validity of cue

Predictions

NS	S-
NS	S+



	RT	%corr	%inc	%antic
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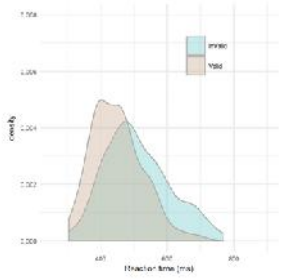
Invalid	511	94.4	5.6	Removed
Valid	445	88.2	5.9	5.9
Invalid	511	93.2	5.1	1.3

Speed/accuracy trade-off only emerges when considering anticipations



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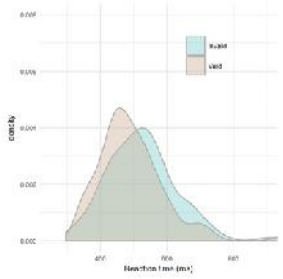
Consistent speed/accuracy trade-off with and without anticipations



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Valid	468	94.7	3.8	1.5
Invalid	505	93.2	5.1	1.8

Consistent performance gain with and without anticipations

Posner group II: The data

- Replicate Malevich et al, 2018 (I,II,III)
  - Discrimination response
  - More reliable facilitation in literature

Summary of results

	Facilitation?	IOR?	Theory?	CTOA	Modality
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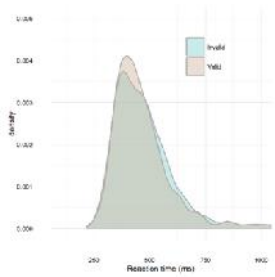
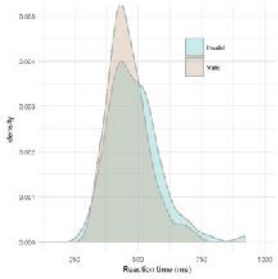
Malevich et al, 2018 (I,II,III)	No	Yes	--	**Random**	Simple Button
Malevich et al, 2018 (IV)	Yes	Yes	Attention?	**Block Short/Long**	Simple Button
Posner group phase 2 (Anastasia)	Hell yes	--	?	**Block Short/ Long, Random**	Discrimination

Theory	Properties and mechanics	Error Predictions				
Change in *Salience rate*	• Drift rate is calculated from trial onset • Drift value is calculated as salience difference of locations • Negative values can lead to 'negative' accumulation toward incorrect threshold		RT(ms)	%corr	%inc	%antic
		Valid	445	88.2	5.9	5.9
		Invalid	511	93.2	5.1	1.3
Change in *Threshold bias*	• Drift rate is 0 until target onset • Bias parameter is modified at the time of the cue onset • Value of the change depends on salience difference		RT(ms)	%corr	%inc	%antic
		Valid	452	88.5	6.3	5.2
		Invalid	498	93.6	4.5	1.9
Speeded attention	• Drift rate is 0 until target onset • Value of the drift rate is adjusted by proportional salience and validity of cue		RT(ms)	%corr	%inc	%antic
		Valid	468	94.7	3.8	1.5
		Invalid	505	93.2	5.1	1.8
Human data	Initial data from 2afc attentional cuing task best matches the predictions of the speeded attention model		RT(ms)	%corr	%inc	%antic
		Valid	477	96.9	2.9	<1
		Invalid	498	95.9	4.0	<1



Human Data



Speeded attention model data

Next steps

- Raw data from Kruger et al 2014
  - Short CTOAs where we found evidence for perceptual merging
- Raw data from Malevich (in prep)?
  - Unfortunately not until original study is published