

Semantic object-scene inconsistencies affect eye movements, but not in the way predicted by contextualized meaning maps (published in *Journal of Vision*, doi: 10.1167/jov.0.0.08030) – **data and code**

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Overview

Scripts, data, and other files shared here are necessary to reproduce our results (and conduct analyses not included in our paper). The files are divided into ‘steps’. Each ‘step’ has a number, and this number is used in the names of the relevant folders (see folder names below). When appropriate, results of a given step are not stored together with the code generating them but are included in a separate, timestamped folder (again, see below). Descriptions of steps provided here are very brief, but the code we share is usually well-commented (just ignore lots of side-notes, etc.). The majority of folders contain startHere_<doSomething>_script. Start there. If anything is unclear, please do not hesitate to email me (marek.pedziwi@gmail.com) or message on Twitter (@marekPedziwi).

Because of copyrights issues, we are not allowed to share the SCEGRAM images we used in our study. You can access them via this website:

<https://www.scenegrammarlab.com/research/development-of-scene-grammar/scegram-database/>

A copy of this document is included in the repositories with our data (<https://zenodo.org/record/5999046>) and code (<https://zenodo.org/record/5999215>).

If you use our data and/or code, please cite our article.

List of folders (some are in the data repository, some are in the code repository)

- **o_commonCore** – 'universal' functions used in many contexts, including different stages of creating contextualised meaning maps (cMMs)

- **1_params_selection** – selecting parameters of cMMs.
parameters_selection_in_full.m should be read rather than just run.
 - 1a_deploy_paramsSelection_30-Apr-2020 17_43_54
- There is no number two.
- **3_listingPatches** – segmenting images into patches
 - 3a_deploy_listingPatches_15-Oct-2020 11_51_25
- **4_generatingBlocks** – generating lists of patches to be included in the Qualtrics surveys
 - 4a_deploy_generatingBlocks_15-Oct-2020 11_59_02
- **5_deployingBlocks** – generating images to be presented in the surveys (context image + patch to be rated). startHere_deployBlocks_script – see the end of the script; re-run the last section to generate batches of images for blocks. We collected data for each block in a separate Qualtrics survey.
 - 5a_deploy_deployingBlocks_30-Apr-2020 23_24_09
- **6_Qualtrics_surveys** – cMMs_block2_deploy_example.qsf – Qualtrics survey. This file can be loaded into Qualtrics. To collect data for a single block, you need to 1) put images online (we used Amazon image hosting service) and 2) paste a table listing links to them to Qualtrics. Original instructions for raters are available here: <https://osf.io/58wra/>. We used them too.
 - 6a_tablesQualtrics_collectedData
 - 6b_controlTables
- **7_qualtrics_data_checks_and_aggregation** – aggregating data from multiple Qualtrics surveys
 - 7a_deploy_qualtrics_aggregated_15-Oct-2020 14_24_38
- **8_stitching** – ‘stitching’ cMMs from the rating data
 - 8a_deploy_stitching_18-Oct-2020 23_12_56 (note that visualization with SCEGRAM images cannot be shared)
- **9_eyeTracking_collectedData** – eye tracking data we used. We shared that data previously, with our 2021 Cognition paper.
- **10_data_mill_full_maps_Matlab** – data analyses. Some of them are not included in the paper.

- 10a_addingMMs_15-Feb-2021 21_08_31
- 10b_osfMMs_20-May-2021 10_14_40 (see 18_great_reanalysis)
- **11_data_mill_maps_R** – more data analyses. Regarding the R script mapMill_V6_OSF, see point 18_great_reanalysis
- **12_data_mill_patches** – analysing rating of individual patches
- **13_pheno_generation** – preparing Experiment 2. Power analysis, manual selection of patches (we cannot share them because they come from to SCEGRAM)
 - 13a_deploy_assemblingPheno_24-May-2020 14_28_24
- **14_semanticPhenotypes_collectedData** – data from Experiment 2, collected via Qualtrics surveys just like in Experiment 1
- **15_data_mill_semanticPhenotypes_R** – analysis of data from Experiment 2
- **16_Qualtrics_completionTimesMill** – analysis of completion times of the surveys
- **18_great_reanalysis** – analysis including the original implementation of (c)MMs (the *build_meaning_map* function that needs to be downloaded from <https://osf.io/654uh/>). Results from this step were ‘fed back’ to previous analyses, as indicated in the relevant places above. Data from our 2021 Cognition paper (<https://doi.org/10.1016/j.cognition.2020.104465>) might be required here.
 - 18a_adv_19-May-2021_15_04_16

References/relevant papers:

- Henderson, J. M., & Hayes, T. R. (2017). Meaning-based guidance of attention in scenes as revealed by meaning maps. *Nature Human Behaviour*, 1(October).
<https://doi.org/10.1038/s41562-017-0208-0>
- Henderson, J. M., Hayes, T. R., Peacock, C. E., & Rehrig, G. (2021). Meaning maps capture the density of local semantic features in scenes: A reply to Pedziwiatr, Kümmerer, Wallis, Bethge & Teufel (2021). *Cognition*, January, 104742.
<https://doi.org/10.1016/j.cognition.2021.104742>
- Öhlschläger, S., & Vö, M. L.-H. (2017). SCEGRAM: An image database for semantic and syntactic inconsistencies in scenes. *Behavior Research Methods*, 49(5), 1780–1791.
<https://doi.org/10.3758/s13428-016-0820-3>

- Peacock, C. E., Hayes, T. R., & Henderson, J. M. (2019). The role of meaning in attentional guidance during free viewing of real-world scenes. *Acta Psychologica*, 198(December 2018), 102889. <https://doi.org/10.1016/j.actpsy.2019.102889>
- Pedziwiatr, M. A., Kümmerer, M., Wallis, T. S. A., Bethge, M., & Teufel, C. (2021a). Meaning maps and saliency models based on deep convolutional neural networks are insensitive to image meaning when predicting human fixations. *Cognition*, 206, 104465. <https://doi.org/10.1016/j.cognition.2020.104465>
- Pedziwiatr, M. A., Kümmerer, M., Wallis, T. S. A., Bethge, M., & Teufel, C. (2021b). There is no evidence that meaning maps capture semantic information relevant to gaze guidance: Reply to Henderson, Hayes, Peacock, and Rehrig (2021). *Cognition*, 214, 104741. <https://doi.org/10.1016/j.cognition.2021.104741>