# BigSTeP toolbox

Updated on Aug. 8, 2023 by Yusuke Takeda

## 1. Introduction

BigSTeP toolbox is a suite of MATLAB functions to perform STeP and BigSTeP proposed in the following papers.

- Takeda Y., Hiroe N., Yamashita O., Sato M., 2016. Estimating repetitive spatiotemporal patterns from resting-state brain activity data. NeuroImage 133:251-65. https://doi.org/10.1016/j.neuroimage.2016.03.014

- Takeda Y., Itahashi T., Sato M., Yamashita O., 2019. Estimating repetitive spatiotemporal patterns from many subjects' resting-state fMRIs. NeuroImage 203:116182. https://doi.org/10.1016/j.neuroimage.2019.116182

From resting-state brain activity data, such as MEG and fMRI, STeP estimates repetitive spatiotemporal patterns without using their onset and shape information (Fig. 1) (Takeda et al., 2016).

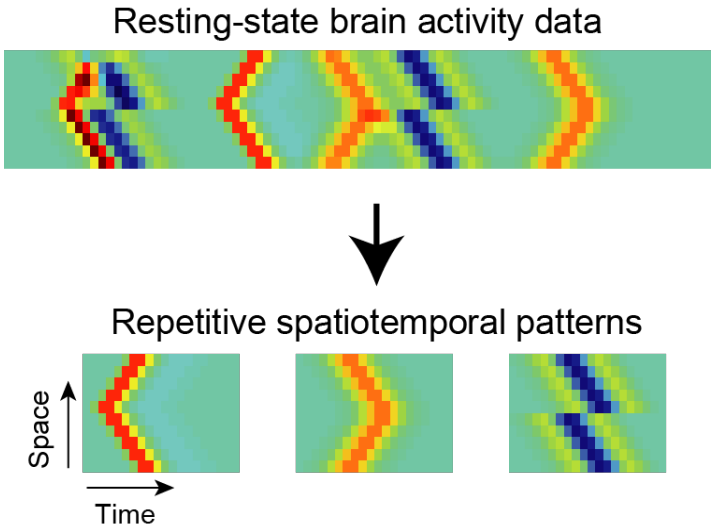


Figure 1: Purpose of STeP.

BigSTeP is an extension of STeP for big data. From many subjects' resting-state brain activity data, BigSTeP estimates spatiotemporal patterns that are common across subjects (common spatiotemporal patterns) as well as the corresponding

spatiotemporal patterns in each subject (subject-specific spatiotemporal patterns) (Fig. 2) (Takeda et al., 2019).

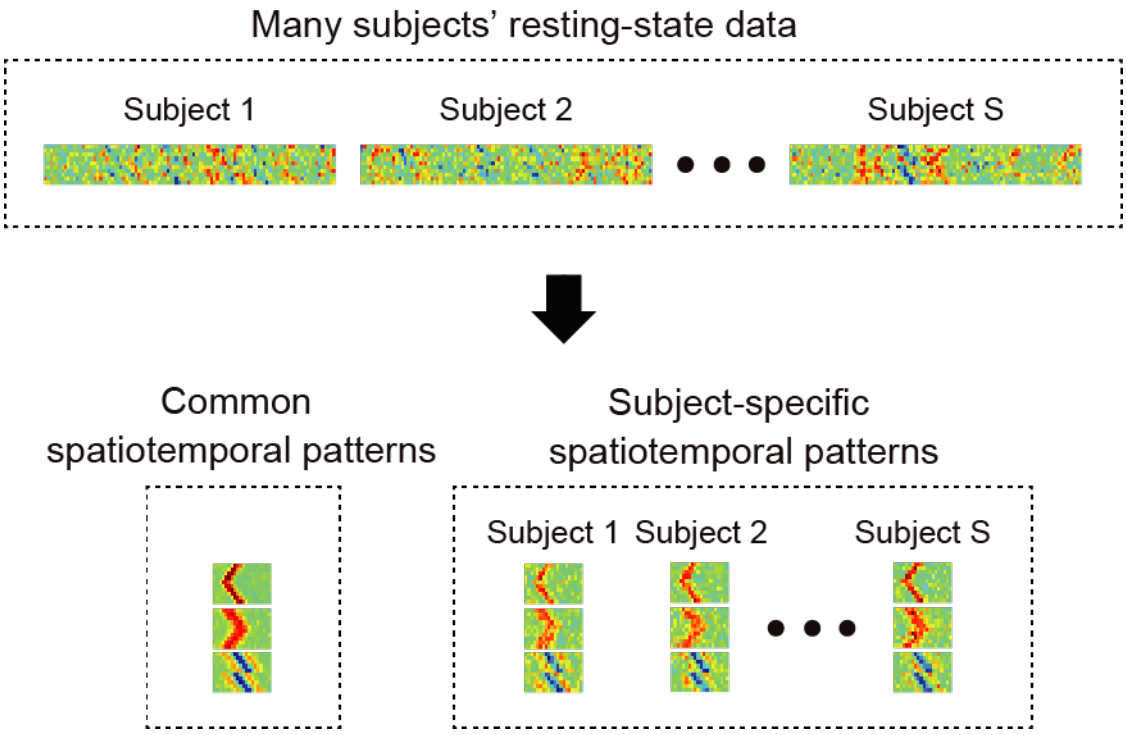


Figure 2: Purpose of BigSTeP.

## 2. System Requirements

BigSTeP toolbox works on MATLAB (R2010a or later).

## 3. Demo programs

Please start from the following demo programs to learn how this toolbox works.

bs_demo_STeP_m: Demo program for STeP

bs_demo_BigSTeP.m: Demo program for BigSTeP

## 4. Main programs

bs_STeP.m : This program performs STeP

bs_BigSTeP.m : This program performs BigSTeP

## 5. Feedback & Bug report

Any feedback and bug reports are welcome. Please contact me if you have any

questions (takeda@atr.jp).

## 6. Acknowledgements

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## 7. References

STeP paper:

- Takeda Y., Hiroe N., Yamashita O., Sato M., 2016. Estimating repetitive spatiotemporal patterns from resting-state brain activity data. NeuroImage 133:252-65. https://doi.org/10.1016/j.neuroimage.2016.03.014

BigSTeP paper:

- Takeda Y., Itahashi T., Sato M., Yamashita O., 2019. Estimating repetitive spatiotemporal patterns from many subjects’ resting-state fMRIs. NeuroImage 203:116182. https://doi.org/10.1016/j.neuroimage.2019.116182

- Takeda Y., Niroe N., Yamashita O., 2021. Whole-brain propagating patterns in human resting-state brain activities. NeuroImage 245:118711. https://doi.org/10.1016/j.neuroimage.2021.118711