

## Overconvergent modular symbols - Winter term 2019/19

We will closely follow chapter III of Joel Bellaïche's course notes [Bel18]. In the article [Pol14] Robert Pollack gives a nice overview of the topic.

### Talk 1. Group cohomology - Overview

- Definition
- Shapiro's lemma
- Examples

References: [Sha18]

### Talk 2. Modular forms - Overview

- Petersson inner product
- Hecke action
- newforms

### Talk 3. Modular symbols - first properties

- $\Delta_0$  is finitely generated
- flat base change
- Hecke action
- $P_k$  and  $V_k$

References: Sections III.1.1, III.1.2, III.2.1 and III.2.2 of [Bel18], Section 2 of [PS11]

### Talk 4. Eichler-Shimura isomorphism

- modular symbol associated to modular form
- $\pm$ -eigenspaces
- Eichler-Shimura isomorphism

References: Sections III.2.4-III.2.9 of [Bel18]

### Talk 5. Application to L-series

- L-series of modular form
- Algebraicity of L-values
- Congruences between modular forms

References: III.3.1-III.3.2

### Talk 6. Distribution spaces

- P-adic function and distribution spaces
- Mellin transform

References: III.4-III.5 of [Bel18]

### Talk 7. Steven's control theorem

- Fundamental exact sequence
- Compactness of  $U_p$
- Steven's control theorem

References: III.6 of [Bel18]

### Talk 8. Algorithmic control theorem

- Greenberg's algorithmic proof of Steven's control theorem

References: [Gre07]

### Talk 9. p-adic L-functions

- Overconvergent construction of the p-adic L-function associated to a modular form

References: III.7 of [Bel18]

If time permits there will be some talks on the construction of the eigencurve.

## REFERENCES

- [Bel18] J. Bellaïche. *Eigenvarieties, families of Galois representations,  $p$ -adic  $L$ -functions*. course notes. <http://people.brandeis.edu/~jbellaic/preprint/coursebook.pdf>, 2018.
- [Gre07] Matthew Greenberg. Lifting modular symbols of non-critical slope. *Israel Journal of Mathematics*, 161(1):141–155, Oct 2007.
- [Pol14] R. Pollack. *Overconvergent modular symbols*. Contributions in Mathematical and Computational Sciences. Springer International Publishing, 2014.
- [PS11] Robert Pollack and Glenn Stevens. Overconvergent modular symbols and  $p$ -adic  $l$ -functions. *Annales scientifiques de l'École Normale Supérieure*, Ser. 4, 44(1):1–42, 2011.
- [Sha18] R. Sharifi. *Group and Galois cohomology*. course notes. <http://math.ucla.edu/~sharifi/groupcoh.pdf>, 2018.