

# EML: Distribution of Margulis Invariants

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## 1 Description

**Goal:** The Margulis invariant is a point in the plane  $\mathbb{R}^2$  associated to each pair  $(A, u)$  where  $A \in \text{SL}(3, \mathbb{R})$  is a real  $3 \times 3$  matrix with determinant equal to 1 and  $u$  is a real  $3 \times 3$  traceless matrix. This is computed using Jordan decomposition of matrices. Such pairs are used to construct certain flat affine manifolds, called Margulis spacetimes, of dimension 8. Two pairs produce the same manifold if they have equal Margulis invariants. The aim is to start with two such pairs  $\gamma_1 = (A, u)$ ,  $\gamma_2 = (B, v)$  and plot the distribution of the Margulis invariants of words made out of their products:  $\eta_1^{n_1} \dots \eta_k^{n_k}$ , for  $\eta_1, \dots, \eta_k \in \{\gamma_1, \gamma_2\}$  and  $k, n_j \in \mathbb{N}$ .

**Tools:** Sagemath, python

**Level:** Moderate

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