Analysis and Differential Geometry Seminar

Can computational math help settle down Morrey's and Iwaniec's conjectures?

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Abstract: In 1987, D. L. Burkholder proposed a very simple looking and explicit energy functionals I_p defined on $\mathbb{S}$, the set of smooth functions on the complex plane. A question of great interest is to know whether or not $\sup_{\mathbb{S}} I_p \geq 0$. Since the function I_p is homogeneous of degree p, it is very surprising that it remains a challenge to prove or disprove that $\sup_{\mathcal{S}} I_p \geq 0$. Would $\sup_{\mathbb{S}} I_p \geq 0$, the so-called Iwaniec's conjecture on the Beurling–Ahlfors Transform in harmonic analysis would hold. Would $\sup_{\mathcal{S}} I_p > 0$, the so-called Morrey's conjecture in elasticity theory would hold. Therefore, proving or disproving that $\sup_{\mathbb{S}} I_p \geq 0$ is equally important. Since the computational capacity of computers has increased exponentially over the past decades, it is natural to hope that computational mathematics could help settle these two conjectures at once.

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