INDIAN INSTITUTE OF TECHNOLOGY GUWAHATI
SHORT ABSTRACT OF THESIS

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Thesis Title: ASPECTS OF FERMI ARCS AND SURFACES FROM THE PERSPECTIVE OF GAUGE -GRAVITY DUALITY

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SHORT ABSTRACT

Despite several efforts, strongly correlated systems still pose as one of the most challenging conundrums in theoretical physics. The difficulty in modelling and solving the problems has grown even more after the discovery of high-temperature superconductors, topological insulators, Dirac and Weyl's semimetals. Experimental results on these materials have revealed many intriguing phenomena such as pseudo-gap phase and Fermi arcs, which we have very little understanding theoretically. These systems are not suitable to be described by conventional perturbative approaches. In the present thesis, we used an alternative method with a non-perturbative tool provided by the gauge-gravity duality, allowing us to access the strongly coupled regime. With the motivation to understand the underlying mechanism that gives rise to these peculiar phenomena, we proposed several holographic models by exploring the symmetries of either the background geometry in the bulk or at the boundary. By computing the fermions spectral function, we primarily explore the properties of the Fermi surface and Fermi arcs in certain strongly coupled systems of interests. Our results revealed some interesting features that are closely related to those that are seen in real materials from condensed matter experiments.