Universal quantum criticality in Hubbard models with mass-less Dirac dispersion YUICHI OTSUKA, SEIJI YUNOKI, RIKEN Advanced Institute for Computational Science, SANDRO SORELLA, SISSA - International School for Advanced Studies — We investigate the metal-insulator transition of two-dimensional interacting electrons with massless Dirac-like dispersion, describe by the Hubbard models on two geometrically different lattices: honeycomb and π-flux square lattices. By performing large-scale quantum Monte Carlo simulations followed by careful finite-size scaling analyses, we find that the transition from semi-metallic to antiferromagnetic insulating phases is continuous and evaluate the critical exponents with a high degree of accuracy for the corresponding universality class, which is described in the continuous limit by the Gross-Neveu model. We furthermore discuss the fate of the quasiparticle weight and the Fermi velocity across this transition.

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