Ramanujan bigraphs associated with $SU(3)$ over a $p$-adic field
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We use the representation theory of the quasisplit form $G$ of $SU(3)$ over a $p$-adic field to investigate whether certain quotients of the Bruhat–Tits tree associated to this form are Ramanujan bigraphs. We show that a quotient of the tree associated with $G$ (which is a biregular bigraph) is Ramanujan if and only if $G$ satisfies a Ramanujan type conjecture. This result is analogous to the seminal case of $PGL_2(\mathbb{Q}_p)$ considered by Lubotzky, Phillips and Sarnak. As a consequence, Rogawski’s classification of the automorphic spectrum of the unitary group in three variables implies the existence of certain infinite families of Ramanujan bigraphs.