Introduction to the theory of circulant association schemes and its applications.

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A circulant graph on n points is a Cayley graph over a cyclic group $\mathbb{Z}_n$. It is completely defined by its connection set $S \subseteq \mathbb{Z}_n$. It is a trivial observation that two circulants with connection sets S and $mS, m \in \mathbb{Z}_n^*$ are isomorphic. The converse is not true in general. The following problem is known as the isomorphism problem for circulants.

Given two circulant graphs $\mathsf{Cay}(\mathbb{Z}_n, S)$ and $\mathsf{Cay}(\mathbb{Z}_n, T)$. Find an effective algorithm which recognizes an isomorphism between them.

This problem may be naturally extended to Cayley graphs. In our talk we shall discuss connections between the isomorphism problem for Cayley graphs, Cayley association shemes and Schur rings. We also give an overview of the recent results related to the isomorphism problem for circulants.