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**Mozhgan Mirzaei\*** (momirzae@ucsd.edu) and **Andrew Suk**. *Extremal Configurations in Point-Line Arrangements*. Preliminary report.

The famous Szemerédi-Trotter theorem states that any arrangement of  $n$  points and  $n$  lines in the plane determines  $O(n^{4/3})$  incidences, and this bound is tight. In this talk, we present some Turán-type results for point-line incidences. Let  $\mathcal{L}_1$  and  $\mathcal{L}_2$  be two sets of  $t$  lines in the plane and let  $P = \{\ell_1 \cap \ell_2 : \ell_1 \in \mathcal{L}_1, \ell_2 \in \mathcal{L}_2\}$  be the set of intersection points between  $\mathcal{L}_1$  and  $\mathcal{L}_2$ . We say that  $(P, \mathcal{L}_1 \cup \mathcal{L}_2)$  forms a *natural  $t \times t$  grid* if  $|P| = t^2$ , and  $\text{conv}(P)$  does not contain the intersection point of some two lines in  $\mathcal{L}_i$ , for  $i = 1, 2$ . For fixed  $t > 1$ , we show that any arrangement of  $n$  points and  $n$  lines in the plane that does not contain a natural  $t \times t$  grid determines  $O(n^{4/3 - \varepsilon})$  incidences, where  $\varepsilon = \varepsilon(t)$ . We also provide a construction of  $n$  points and  $n$  lines in the plane that does not contain a natural  $2 \times 2$  grid and determines at least  $\Omega(n^{1 + \frac{1}{14}})$  incidences. This is joint work with Andrew Suk. (Received August 12, 2019)