Explanatory Notes for 6.390

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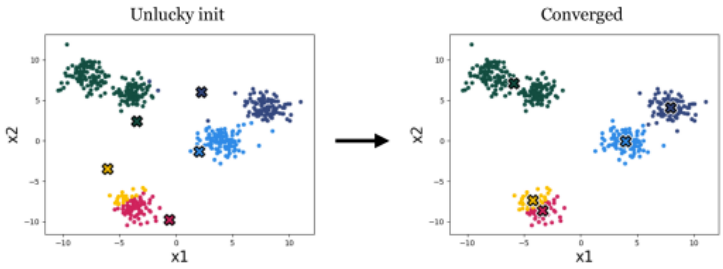
Initialization

The first problem we have is related to something we mentioned at the end of the last section: k-means is not **convex**.

That means we can find **local** minima that are not the **global** minimum: our **initialization** (our **starting** clusters) can affect whether we end up in a useful minimum.

The reason why is, mathematically, the same as when we first introduced the idea of a local minimum.



In this example, notice that we ended up with convergence on some very **bad** clusters: the bottom cluster is split in **half**!

The easiest way to resolve this is to run k-means multiple times with different initializations.

Other techniques exist, but this is the simplest one.

Concept 1

Getting an **unlucky initialization** can result in **clusters** that aren't **useful**.

We try to **solve** this by running our algorithm **multiple times**.