

# Questions for Discussion

## 5.1

What are your first impressions here? If some dark matter events are in this plot, where would they show up? Can you conclude on first sight that we have or have not found dark matter? If yes, how many dark matter events do you think we've seen?

No, maybe it's just me, but I can't tell on first blush whether we have or haven't found dark matter. It seems to just look like the background noise distribution model from before.

## 5.2

When you apply the cut, how many events,  $N_{\text{ROI}}$ , survive?

Only 66 events survive.

## 5.3a

What is the average number of background events  $N_{\text{ex}}$  you expect to leak below your cut value? (This can be a non-integer number.) Hint: you will need to look at the background leakage curve at the top of this notebook, with a knowledge of how many overall events there were.

Since there were a total of 300 events and the background leakage curve at  $X_c$  is around 10%, I expect around 30 background events to leak below the cut value.

## 5.4a

What is the probability that you will see  $N_{\text{ROI}}$  or more events due to just normal background fluctuations? Can you quote a p-value for observing  $N_{\text{ROI}}$  under the assumption that only background is present?

The probability is extremely low: 4.220659465985886e-09. This is the p-value because it's the probability we see this result assuming the null hypothesis (i.e., only background is

present).

## 5.5a

In qualitative terms, how confident are you that you discovered dark matter?

Because the p-value is so incredibly small, I'm rather confident that I've discovered dark matter.