OpenDreamKit

Work Package 4: User Interfaces

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User Interfaces for OpenDreamKit

- Notebook Interfaces
- Interactive Documentation
- Applications of Notebooks, Widgets

We have already computed $P(X|A)$ above. On the other hand, $P(X| \sim A)$ is subjective: our code can pass tests but still have a bug in it, though the probability there is a bug present is reduced. Note this is dependent on the number of tests performed, the degree of complication in the tests, etc. Let's be conservative and assign $P(X| \sim A) = 0.5$. Then

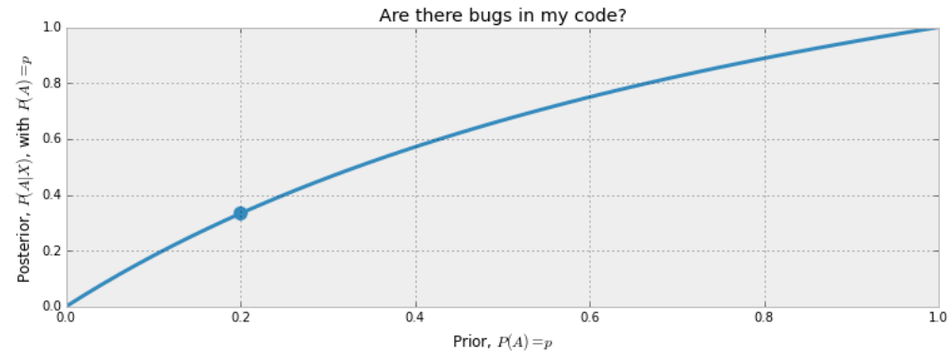
$$P(A|X) = \frac{1 \cdot p}{1 \cdot p + 0.5(1-p)}$$

$$= \frac{2p}{1+p}$$

This is the posterior probability. What does it look like as a function of our prior, $p \in [0, 1]$?

```
figsize(12.5, 4)
p = np.linspace(0, 1, 50)
plt.plot(p, 2 * p / (1 + p), color="#348ABD", lw=3)
# plt.fill_between(p, 2*p/(1+p), alpha=.5, facecolor=["#A60628"])
plt.scatter(0.2, 2 * (0.2) / 1.2, s=140, c="#348ABD")
plt.xlim(0, 1)
plt.ylim(0, 1)
plt.xlabel("Prior, $P(A) = p$")
plt.ylabel("Posterior, $P(A|X)$, with $P(A) = p$")
plt.title("Are there bugs in my code?")
```

```
<matplotlib.text.Text at 0x1051de650>
```



Notebook Interfaces

- Unify Notebooks (SageJupyter)
- Improve Notebook Collaboration
  - High Latency (diff & merge)
  - Real-time (GDocs-style, already in SageMathCloud)
- Notebooks for Testing and Verification

Interactive Documentation

- Active Documentation with Notebooks
- Application for discovering and displaying documentation
- Active Document Hub/Portal (MathHub)
- Structured documents (books, articles)

Applications

- Explore web-based 3D-vis in notebooks
- Fluid Dynamics notebook vis
- Micromagnetics:
  - Notebook examples
  - VRE for micromagnetics
  - Non-notebook web application