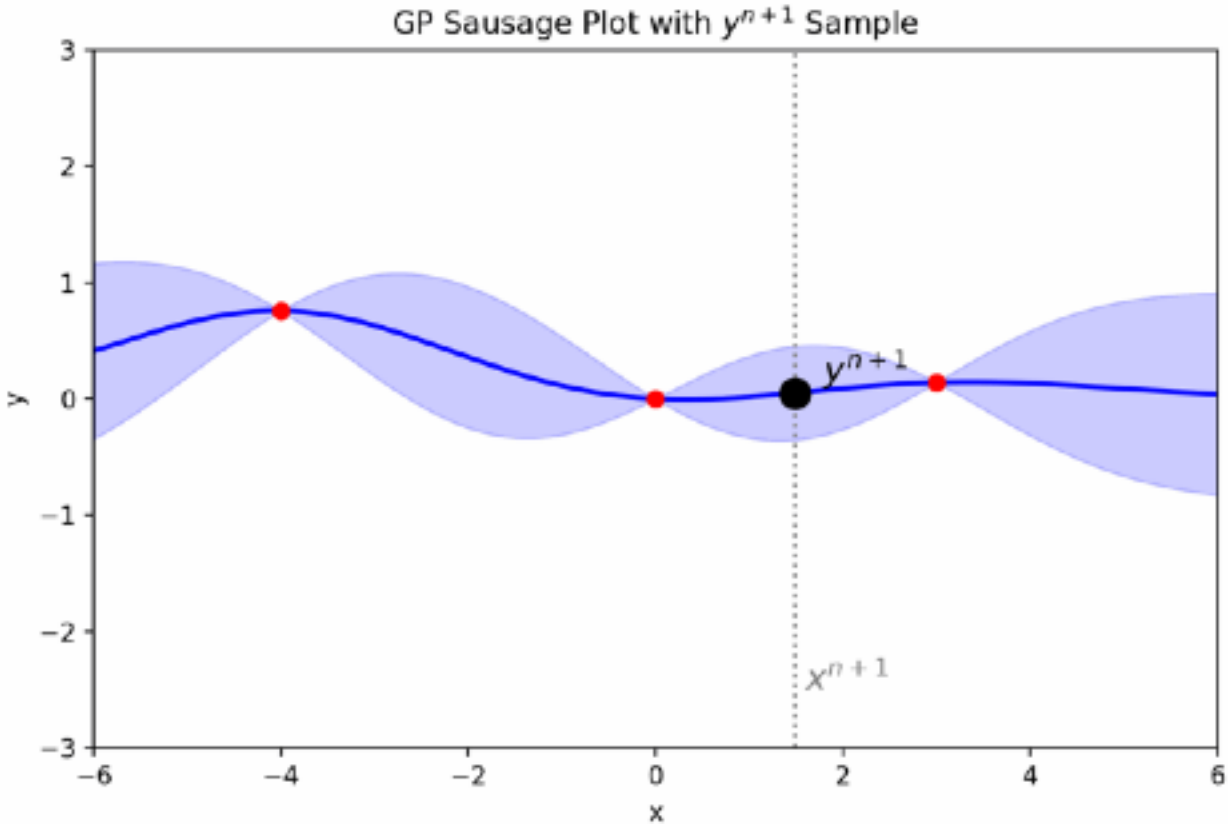
According to our GP we may have many realizations of y^{n+1}

$\sqcap$



GP Sausage Plot with y^{n+1} Sample
y^{n+1}
x^{n+1}
3
2
1
0
−1
−2
−3
y
−6
−4
−2
0
2
4
6
x

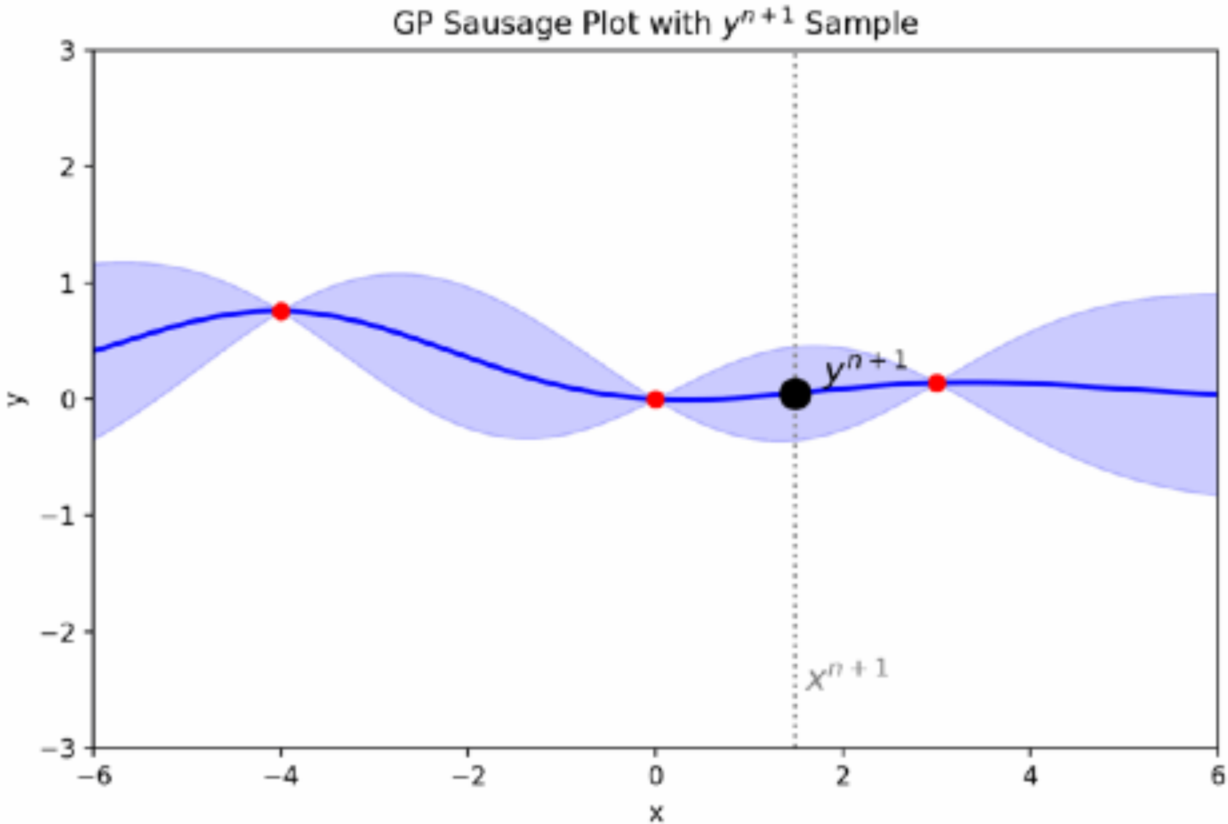
Formal Definition

$$\mathrm{KG}(x) = \mathbb{E}\left[\max_{x''\in\mathcal{X}}\{\mu_y^{n+1}(x'')\} - \max_{x'\in\mathcal{X}}\{\mu_y^{n}(x')\} \;\middle|\; x^{n+1} = x\right].$$

Lets hypothise that we sample at x

The maximum of the new posterior after getting updated with y^{n+1}

The maximum of the old posterior


GP Sausage Plot with y^{n+1} Sample
3
2
1
0
−1
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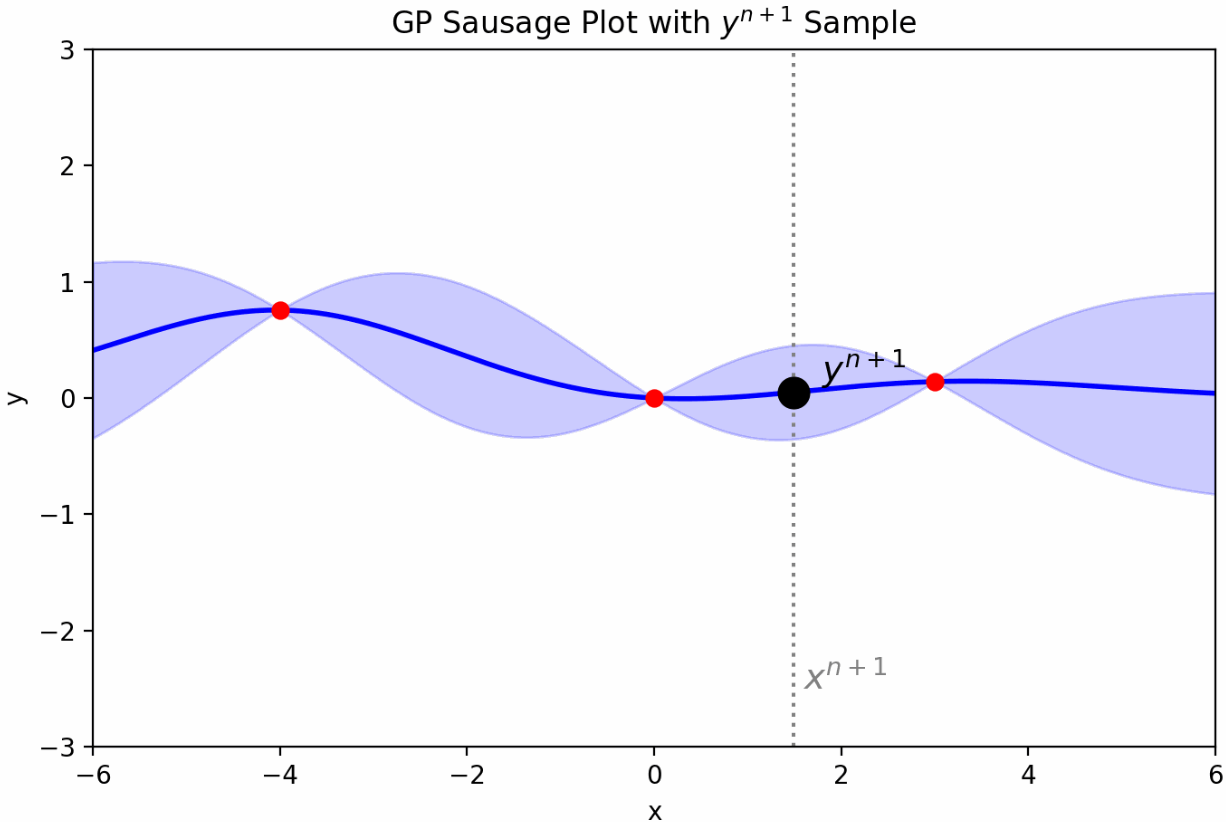
−3
y
−6
−4
−2
0
2
4
6
x
y^{n+1}
X^{n+1}



GP Sausage Plot with y^{n+1} Sample
y^{n+1}
x^{n+1}
y
x
3
2
1
0
−1
−2
−3
−6
−4
−2
0
2
4
6

Formal Definition

$$\mathrm{KG}(x) = \mathbb{E}\left[\underbrace{\max_{x''\in\mathcal{X}}\{\mu_y^{n+1}(x'')\}}_{\text{The maximum of the new posterior after getting updated with } y^{n+1}} - \overbrace{\max_{x'\in\mathcal{X}}\{\mu_y^{n}(x')\}}^{\text{The maximum of the old posterior}} \;\middle|\; x^{n+1} = x\right].$$

Monte Carlo Sampling - 1

WuandFrazier2017