Index

annealed particle filter, 49 anti-chance, 30 average, see probability, formal models of Bayes' rule, 22 Bayes' theorem, 22 central limit theorem, see probability distributions condensation, see particle filter conditional independence, see probability, formal models of conditional probability, see probability, formal models of covariance, see probability, formal models of cumulative distribution function, see probability, formal models of events, see probability, formal models of expectation, see probability, formal models of expected value, see probability, formal models of extended Kalman filter, 34 gambler's fallacy, 30 independence, see probability, formal models of inference, see probabilistic inference joint probability, 5 joint probability density function, see probability, formal models of joint probability distribution function, see probability, formal models of

likelihood, see probabilistic inference marginalisation, see probability, formal models of maximum likelihood inference, see probabilistic inference maximum a posteriori, see probabilistic inference mean, see probability, formal models of model selection, see probabilistic inference, 27 non-linear dynamic models, see tracking particle filter, see tracking Poisson distribution, see probability distributions posterior, see probabilistic inference, see probabilistic inference prior, see probabilistic inference, see probabilistic inference probabilistic inference Bayesian inference, 22 posterior, 22 prior, 22 Bayesian philosophy, 22 inference, 20 likelihood, 20, 21 MAP inference, 22, 23 maximum likelihood inference, 20, 21 model selection, 26 applications, 27 by Bayes rule, 27 posterior as inference, 24-26 probability density function, see probability, formal models of

probability distributions, 18 binomial distribution, 18 Gaussian distribution, 19 multivariate normal distribution, 19normal distribution, 19, 21 central limit theorem, 19 Poisson distribution, 19 sampled representations, 36 uniform distribution, 18 probability model, 4 probability of the event A, 4 probability, formal models of, 3, 18 choosing probability models, 5 by conditional independence, 8 by frequency, 8–10 by independence, 6-8 by subjective probability, 10, 11 by symmetry, 6 conditional independence, 7 conditional probability, 5 events, 3 expectation, 15 average, 16 computed using sampled representations, 37, 39 covariance, 16 mean, 16 notation, 16 standard deviation, 16 variance, 16 in continuous spaces, 11 conditional independence, 12 conditional probability, 12 cumulative distribution function, 13event structures, 11 independence, 12 probability density function, 13 representing probability models, 12 in discrete spaces, 3 conditional probability, 5 example of event space, 3, 4 example of probability functions, 4

joint probability, 5 probability of the event A, 4 properties of events, 3 properties of probability function. 4 independence, 6 integration by sampling sampling distribution, 37 joint distribution, 17 joint probability density function, 17 random variables, 14 conditional probability, 15 independence, 15 representation of probability distributions by sampled representations, 37, 38 marginalising a sampled representation, 38, 40 prior to posterior by weights, 39, 41 useful relations, 5, 16, 22 random variable, see probability, formal models of sample impoverishment, 43 sampling distribution, see probability, formal models of standard deviation, see probability, formal models of subjective probability, 10 taking an expectation, see probability, formal models of tracking applications tracking people with particle filtering, 48 non-linear dynamic models, 33 example of bad behaviour, 34, 35particle filtering as inference method, 36unpleasant likelihood functions, 36

particle filtering, 36

practical issues, 46 sampled representations, 36-41simplest particle filter, 40 simplest particle filter, algorithm, 42simplest particle filter, correction step, 42 simplest particle filter, difficulties with, 43 simplest particle filter, prediction step, 41 tracking people, 48 working particle filter, 44-47working particle filter, by resampling, 44 tracking people with particle filtering, 48

variance, see probability, formal models of