



Applied Machine Learning Syllabus

PROF. DR. HELLINTON HATSUO TAKADA

INSTITUTE OF MATHEMATICS AND STATISTICS, UNIVERSITY OF SÃO PAULO

1998, 1999, 2000, 2001, 2002, 2003, 2004, 2005, 2006, 2007, 2008, 2009, 2010, 2011, 2012, 2013, 2014, 2015, 2016, 2017, 2018, 2019, 2020, 2021, 2022, 2023, 2024, 2025, 2026, 2027, 2028, 2029, 2030, 2031, 2032, 2033, 2034, 2035, 2036, 2037, 2038, 2039, 2040, 2041, 2042, 2043, 2044, 2045, 2046, 2047, 2048, 2049, 2050, 2051, 2052, 2053, 2054, 2055, 2056, 2057, 2058, 2059, 2060, 2061, 2062, 2063, 2064, 2065, 2066, 2067, 2068, 2069, 2070, 2071, 2072, 2073, 2074, 2075, 2076, 2077, 2078, 2079, 2080, 2081, 2082, 2083, 2084, 2085, 2086, 2087, 2088, 2089, 2090, 2091, 2092, 2093, 2094, 2095, 2096, 2097, 2098, 2099, 2100, 2101, 2102, 2103, 2104, 2105, 2106, 2107, 2108, 2109, 2110, 2111, 2112, 2113, 2114, 2115, 2116, 2117, 2118, 2119, 2120, 2121, 2122, 2123, 2124, 2125, 2126, 2127, 2128, 2129, 2130, 2131, 2132, 2133, 2134, 2135, 2136, 2137, 2138, 2139, 2140, 2141, 2142, 2143, 2144, 2145, 2146, 2147, 2148, 2149, 2150, 2151, 2152, 2153, 2154, 2155, 2156, 2157, 2158, 2159, 2160, 2161, 2162, 2163, 2164, 2165, 2166, 2167, 2168, 2169, 2170, 2171, 2172, 2173, 2174, 2175, 2176, 2177, 2178, 2179, 2180, 2181, 2182, 2183, 2184, 2185, 2186, 2187, 2188, 2189, 2190, 2191, 2192, 2193, 2194, 2195, 2196, 2197, 2198, 2199, 2200, 2201, 2202, 2203, 2204, 2205, 2206, 2207, 2208, 2209, 2210, 2211, 2212, 2213, 2214, 2215, 2216, 2217, 2218, 2219, 2220, 2221, 2222, 2223, 2224, 2225, 2226, 2227, 2228, 2229, 2230, 2231, 2232, 2233, 2234, 2235, 2236, 2237, 2238, 2239, 2240, 2241, 2242, 2243, 2244, 2245, 2246, 2247, 2248, 2249, 2250, 2251, 2252, 2253, 2254, 2255, 2256, 2257, 2258, 2259, 2260, 2261, 2262, 2263, 2264, 2265, 2266, 2267, 2268, 2269, 2270, 2271, 2272, 2273, 2274, 2275, 2276, 2277, 2278, 2279, 2280, 2281, 2282, 2283, 2284, 2285, 2286, 2287, 2288, 2289, 2290, 2291, 2292, 2293, 2294, 2295, 2296, 2297, 2298, 2299, 2300, 2301, 2302, 2303, 2304, 2305, 2306, 2307, 2308, 2309, 2310, 2311, 2312, 2313, 2314, 2315, 2316, 2317, 2318, 2319, 2320, 2321, 2322, 2323, 2324, 2325, 2326, 2327, 2328, 2329, 2330, 2331, 2332, 2333, 2334, 2335, 2336, 2337, 2338, 2339, 2340, 2341, 2342, 2343, 2344, 2345, 2346, 2347, 2348, 2349, 2350, 2351, 2352, 2353, 2354, 2355, 2356, 2357, 2358, 2359, 2360, 2361, 2362, 2363, 2364, 2365, 2366, 2367, 2368, 2369, 2370, 2371, 2372, 2373, 2374, 2375, 2376, 2377, 2378, 2379, 2380, 2381, 2382, 2383, 2384, 2385, 2386, 2387, 2388, 2389, 2390, 2391, 2392, 2393, 2394, 2395, 2396, 2397, 2398, 2399, 2400, 2401, 2402, 2403, 2404, 2405, 2406, 2407, 2408, 2409, 2410, 2411, 2412, 2413, 2414, 2415, 2416, 2417, 2418, 2419, 2420, 2421, 2422, 2423, 2424, 2425, 2426, 2427, 2428, 2429, 2430, 2431, 2432, 2433, 2434, 2435, 2436, 2437, 2438, 2439, 2440, 2441, 2442, 2443, 2444, 2445, 2446, 2447, 2448, 2449, 2450, 2451, 2452, 2453, 2454, 2455, 2456, 2457, 2458, 2459, 2460, 2461, 2462, 2463, 2464, 2465, 2466, 2467, 2468, 2469, 2470, 2471, 2472, 2473, 2474, 2475, 2476, 2477, 2478, 2479, 2480, 2481, 2482, 2483, 2484, 2485, 2486, 2487, 2488, 2489, 2490, 2491, 2492, 2493, 2494, 2495, 2496, 2497, 2498, 2499, 2500, 2501, 2502, 2503, 2504, 2505, 2506, 2507, 2508, 2509, 2510, 2511, 2512, 2513, 2514, 2515, 2516, 2517, 2518, 2519, 2520, 2521, 2522, 2523, 2524, 2525, 2526, 2527, 2528, 2529, 2530, 2531, 2532, 2533, 2534, 2535, 2536, 2537, 2538, 2539, 2540, 2541, 2542, 2543, 2544, 2545, 2546, 2547, 2548, 2549, 2550, 2551, 2552, 2553, 2554, 2555, 2556, 2557, 2558, 2559, 2560, 2561, 2562, 2563, 2564, 2565, 2566, 2567, 2568, 2569, 2570, 2571, 2572, 2573, 2574, 2575, 2576, 2577, 2578, 2579, 2580, 2581, 2582, 2583, 2584, 2585, 2586, 2587, 2588, 2589, 2590, 2591, 2592, 2593, 2594, 2595, 2596, 2597, 2598, 2599, 2600, 2601, 2602, 2603, 2604, 2605, 2606, 2607, 2608, 2609, 2610, 2611, 2612, 2613, 2614, 2615, 2616, 2617, 2618, 2619, 2620, 2621, 2622, 2623, 2624, 2625, 2626, 2627, 2628, 2629, 2630, 2631, 2632, 2633, 2634, 2635, 2636, 2637, 2638, 2639, 2640, 2641, 2642, 2643, 2644, 2645, 2646, 2647, 2648, 2649, 2650, 2651, 2652, 2653, 2654, 2655, 2656, 2657, 2658, 2659, 2660, 2661, 2662, 2663, 2664, 2665, 2666, 2667, 2668, 2669, 2670, 2671, 2672, 2673, 2674, 2675, 2676, 2677, 2678, 2679, 26

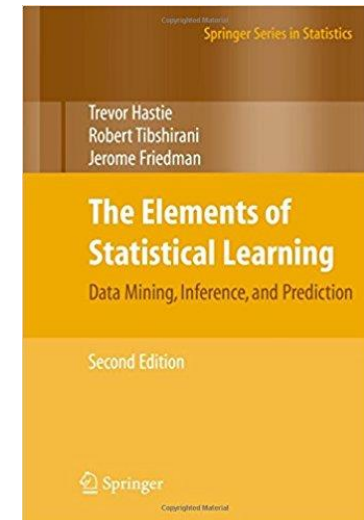
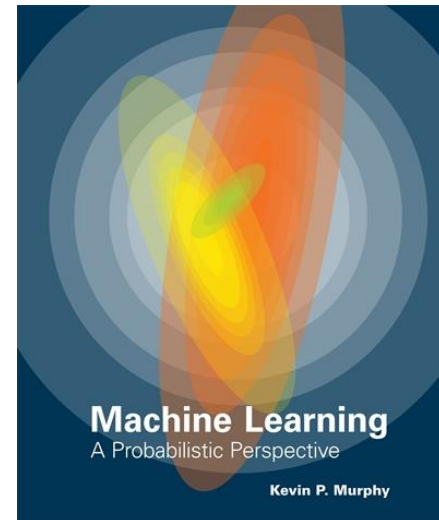
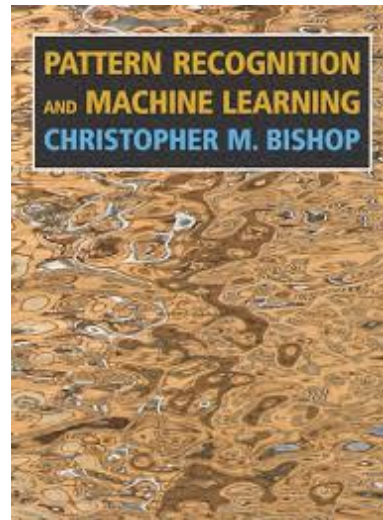
-



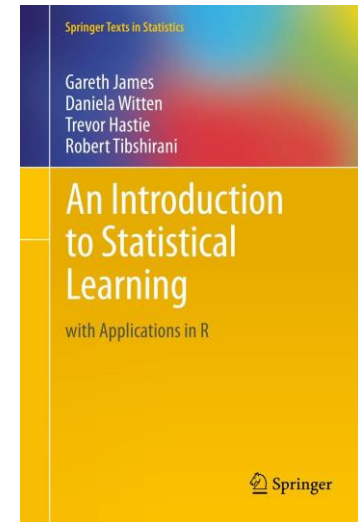
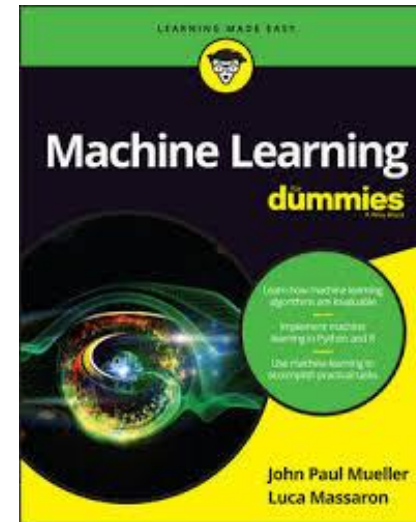
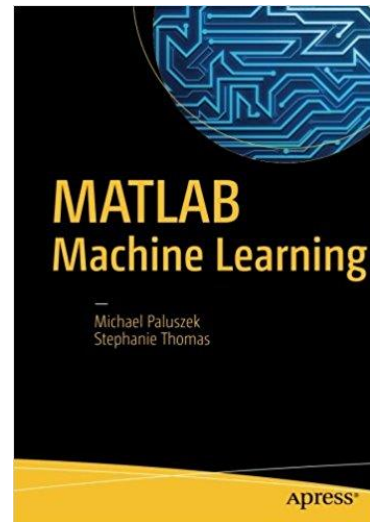
Short-Bio

- ▶ Hellinton Hatsuo Takada has a vice-president position at Itaú Asset Management and is co-founder and director at Blitz-Trading. Additionally, he is also professor at the Getúlio Vargas Foundation (FGV), the Institute of Management Foundation (FIA), the Pontifical Catholic University (PUC) and the Carlos Drummond de Andrade Group. He has a bachelor, master and Ph.D. degrees in Engineering from the Aeronautical Institute of Technology (ITA) and two post-doctorates in Applied Mathematics from the Institute of Mathematics and Statistics (IME) of the University of São Paulo (USP). He is certified with CPA-20 and CGA from the Brazilian Financial and Capital Markets Association (ANBIMA) and has the Certificate in Quantitative Finance from CQF Institute. His research interests include finance, macroeconomics, Bayesian statistics, information theory, statistical machine learning and numerical optimization.

References

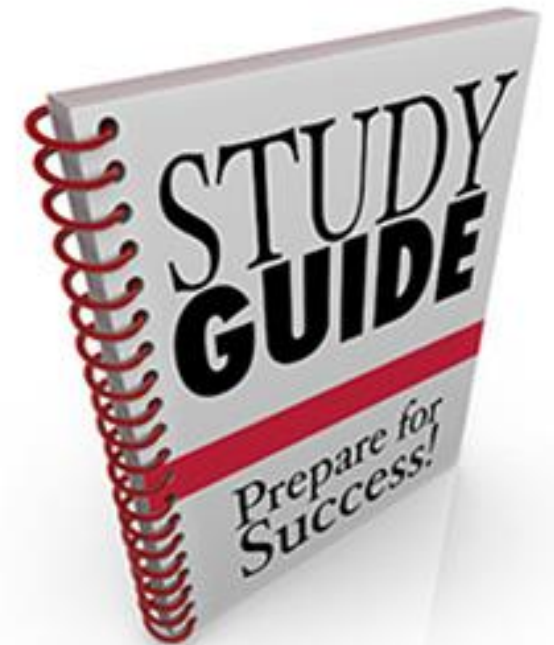


References



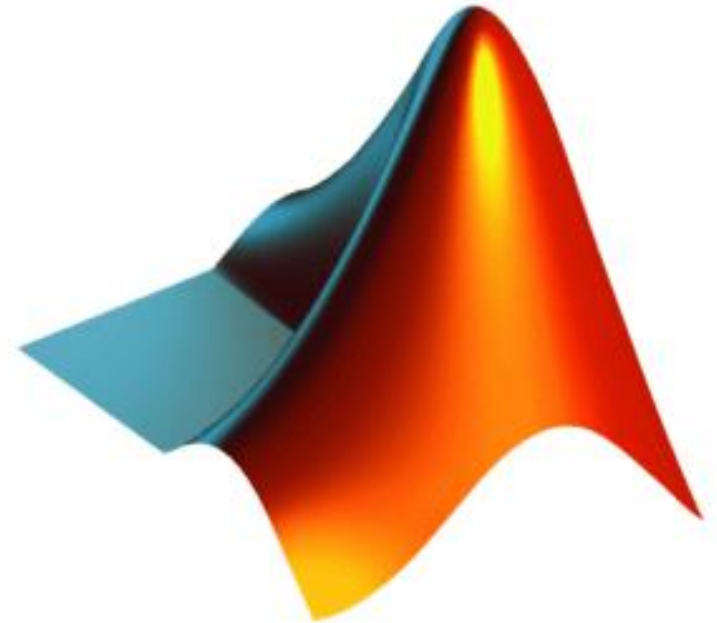
Contents

- ▶ Barber, David, 2010, Bayesian Reasoning and Machine Learning, Cambridge University Press. Notice that the .pdf of the book is freely provided by the author!
- ▶ Basics
 - ▶ Linear Algebra
 - ▶ Probability Theory
 - ▶ Graph Theory
 - ▶ Statistics
 - ▶ Bayesian Inference
 - ▶ Information Theory
 - ▶ Optimization
- ▶ Machine Learning
 - ▶ Supervised Learning
 - ▶ Unsupervised Learning
 - ▶ Classification
 - ▶ Regression
 - ▶ Clustering
 - ▶ Density Estimation
 - ▶ Dimensionality Reduction



Methodology

- ▶ Presentation of the theory
- ▶ Theoretical exercises
- ▶ Programming practices using Matlab (or, if you want, any other programming language at your own risk).



General Information

- ▶ **Classes:** Mondays & Tuesdays; 18:00 – 22:00
- ▶ **E-mail:** hellinton@gmail.com
 - ▶ Response time: approximately 2 days.
 - ▶ E-mail only for conceptual doubts related to the theory and homework activities.
 - ▶ Always include in the subject of the e-mail the name of the course.
 - ▶ Do not attach files in the e-mails!
 - ▶ Do not send the homework by e-mail!
 - ▶ Always express the doubts textually, clearly and briefly.

General Information

► Our meeting days:

- 08-01-2018 (Monday)
- 09-01-2018 (Tuesday)
- 15-01-2018 (Monday)
- 16-01-2018 (Tuesday)
- 22-01-2018 (Monday)
- 23-01-2018 (Tuesday)
- 29-01-2018 (Monday)
- 30-01-2018 (Tuesday)
- 05-02-2018 (Monday)
- 06-02-2018 (Tuesday)
- 19-02-2018 (Monday)
- 20-02-2018 (Tuesday)



Grading Plan

- ▶ Grade = Homework Composition
- ▶ The composition of the grade will be defined at the end of the course depending on the number and difficulty level of the homework activities and the commitment of the students.
- ▶ The homework is always an individual activity. However, it is **ok** to discuss with the colleagues the solution of the homework! **It will not be accepted delayed homework. Please, do not inquire the instructor with the aim of breaking the stablished rules.**
- ▶ The students need to keep a copy of their own homework for study purposes. Some homework will be archived by the instructor to compute the grade at the end of the course. The homework is an essential part of the study path. Usually, the homework has computational implementations. Since the adopted book makes use of Matlab, it is recommended to use Matlab in the implementations.

Teaching Assistant

- ▶ Rafael Sampaio: rafa.ime.usp@gmail.com
- ▶ Important Points:
 - ▶ Make sure Rafael has your e-mail and you have access to it
 - ▶ Rafael will schedule **only one** meeting per week during the course
 - ▶ Pay attention to the meetings scheduled by Rafael
 - ▶ The meetings scheduled by Rafael have only three purposes:
 - ▶ ask questions
 - ▶ deliver exercises
 - ▶ receive exercises
 - ▶ It will not be accepted delayed homework
 - ▶ Please, do not inquire Rafael with the aim of breaking the established rules