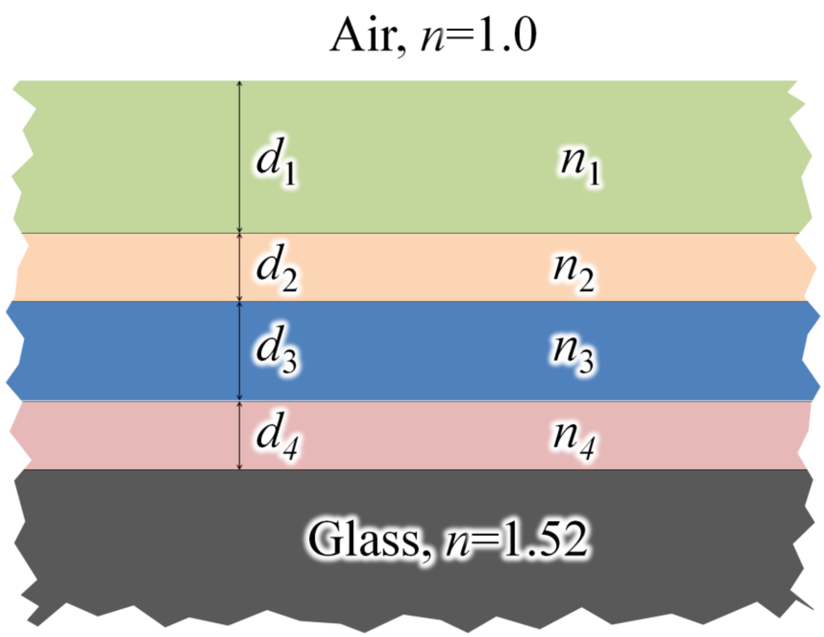
Problem #1: Optimization of an Antireflection Filter

Design and optimize a low-cost thin-film antireflection filter for use on a camera lens. The filter should minimize reflection from air (n_{air} = 1.0) to glass (n_{glass} = 1.5) across as broad of a range of wavelengths as possible, centered at 550 nm. The visible spectrum extends approximately from 300 nm up to 800 nm. You must use four layers with no layer thicknesses greater than one wavelength. The refractive indices for the layers must be within the range $1.0 \leq n \leq 2.0$.



Design this antireflection filter by simultaneously optimizing the values for n_1, n_2, n_3, n_4, d_1, d_2, d_3, and d_4. Draw your final design to scale. Label the dimensions and refractive indices for each layer. Plot the reflectance as a function of wavelength across the entire visible spectrum on a decibel scale. Report the fractional bandwidth of your device and the maximum reflectance within this band. Identify these figure-of-merits in your reflectance plot.

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Fractional Bandwidth: ________________________________ %

Maximum Reflectance: ________________________________ %