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% 111c51502
% CY Fu
% NTUT-UTA AI-EMBA Program
% 2023/09/23

m=[2 5 10 20 50 100 200 500 1000];
n_limit=[100 100 100 100 150 300 400 500 500];
pc1=0.5;
pc2=0.5;
for t=1:9
    p=[];
    g=0;
    m1=floor(pc1*m(t));
    m2=floor(pc2*m(t));
    for n=1:1000
        if n>n_limit(t)
            break;
        end
        pcr=0;
        if n==1
            pcr=0.5;
        else
            for r=0:m2
                for s=0:m1
                    if s>r
                        g=n*((n-1)^2)*pc1*(s+1)/(m1+n);
                    else
                        g=n*((n-1)^2)*pc2*(r+1)/(m2+n);
                    end
                    % pcr=pcr+(g*prod(m2-r+1:m2-r+n-2)/prod(m2+1:m2+n-1)*prod(m1-s+1:m1-s+n-
2)/prod(m1+1:m1+n-1));
                    log_pcr_term = log(g) + sum(log(m2-r+1:m2-r+n-2)) - sum(log(m2+1:m2+n-1)) + sum(log(m1-
s+1:m1-s+n-2)) - sum(log(m1+1:m1+n-1));
                    pcr = pcr + exp(log_pcr_term);
                end
            end
        end
        p=[p [pcr;n]];
    end
    semilogx(p(2,:),p(1,:))
    if m(t)==2
        nStr=['m= ' num2str(m(t))];
        text(p(2,size(p,2)),p(1,size(p,2))-0.005,nStr)
    else
        nStr=[num2str(m(t))];
        text(p(2,size(p,2))+2,p(1,size(p,2)),nStr)
    end
    hold on
end
xlim([1 1000])
ylim([0.49 0.76])
grid()
title({'pr_hw#01_111c51502' ; 'Finite Data Set Accuracy (Pc1=1/2)'}, 'Interpreter', 'none')
set(gca, 'XTick', [1,2,3,4,5,10,20,50,100,200,500,1000])
set(gca, 'XTickLabel', {'1','2','3','4','5','10','20','50','100','200','500','1000'})
xlabel('MEASUREMENT COMPLEXITY n (TOTAL DISCRETE VALUES)')
ylabel('MEAN RECOGNITION ACCURACY Pcr(n,m,Pc1)')

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