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%%Project-2:: Question - 3c
%%To compute Goodness-of-fit test

%%The below function first generates a uniformly random distribution in 0-9
%%and then draws a sequence of 'x' samples (With replacement) and
%%checks the Goodness of Fit test to validate if the samples fit the Dist 1,2..9 or
not
%%Here NULL hypothesis is that the sample fits the distribution 1,2...,9,10
%%Author          Date          Revision
%%Rajasekar Raja   01/23/17      Initial Revision
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function [ ] = goodness_of_fit(M)
    %Initialize
    seq = 0:(M-1);
    %Bin count for distributing the samples for Goodness of fit test
    bin_count = [5,10];
    %Repeat the experiment in 3 iterations incrementing the number of samples
    trails = [50,100,500,1000];
    for expt = 1:length(trails)
        no_of_samples = trails(expt);
        %Sampling with replacement
        sample = datasample(seq,no_of_samples);
        disp('Summary for Discrete uniform distribution 1,2,...10 for');
        for bin_index=1:length(bin_count)
            disp([' -Number of samples -',num2str(no_of_samples),' with ',num2str
(bin_count(bin_index)),' bins']);
            %Edges will be decided on the number of bins(default to 10) = no_of_bins+1
            edges = linspace(1,M,(bin_count(bin_index)+1));
            %To distribute the expected number of entries in each bin equally
            expectedCounts = ones(1,bin_count(bin_index));
            expectedCounts = expectedCounts.*(no_of_samples/bin_count(bin_index));
            %Results in H(reject NULL hypothesis), p-probability of the
            %hypothesis test and stats(Expected/observed count etc..)
            [h,p,st] = chi2gof(sample,'edges',edges,'expected',expectedCounts)
            if h == 0
                disp(' -The NULL hypothesis that "uniform dist random data fits the
sample above" is NOT REJECTED');
            else
                disp(' -The NULL hypothesis that "uniform dist random data fits the
sample above" is REJECTED');
            end
        end
    end
end

```