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                                predict_best_fit_tree
function [category_index predicted_z final_delta] =
predict_best_fit_tree(anchor_tree, delta_tree, new_data_item, predict_z_toggle,
search_toggle)

%search_toggle must be -1,0, or 1;
%this determines whether the algorithm terminates upon the first match, best match
at first depth, or best match in the entire tree, respectively

[width depth] = size(anchor_tree);
new_data_vector = new_data_item{1};

%We initialize the return values to indicate a failure to categorize
min_difference = Inf;
final_delta = Inf;

i = 0;
break_loop_depth = 0;
break_loop_width = 0;
match = 0;

while(i < depth && break_loop_depth == 0)

    j = 0;

    while(j < width && break_loop_width == 0)

        anchor_vector = anchor_tree{width - j, depth - i};
        delta = delta_tree{width - j, depth - i};

        if(isempty(anchor_vector) == 0)

            if(predict_z_toggle == 1)

                new_data_vector(3) = anchor_vector(3);

            endif

            difference = norm(new_data_vector - anchor_vector);

            %Either we have a match, or we've reached the top of the tree
            if(difference <= delta || anchor_vector(3) == Inf)

                %if true, then we have a match
                if(difference < min_difference)

                    match = 1;
                    predicted_z = new_data_vector(3);
                    category_index = [(width - j) (depth - i)];

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                                predict_best_fit_tree
final_delta = delta;
min_difference = difference;

%if true, then we terminate upon first match
if(search_toggle == -1)

    break_loop_depth = 1;
    break_loop_width = 1;

%if true, then we terminate at the end of the current depth
elseif(search_toggle == 0)

    break_loop_depth = 1;

%otherwise, we search the entire tree

endif

%if true, then we've reached the top of the tree with no match
elseif(anchor_vector(3) == Inf && match == 0)

    predicted_z = Inf;
    category_index = [(width - j) (depth - i)];

endif

endif

endif

j = j + 1;

endwhile

i = i + 1;

endwhile

endfunction

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