

## Results for HardMax t = 2000 Heavy Tail Info + Rep

|                        | Thompson Sampling  | Dynamic Epsilon Greedy  | DynamicGreedy   |
|------------------------|--|---|---|
| Thompson Sampling      | <b>0.069</b> +/- 0.024<br>0.046 (0.04, 0.055)<br>Extreme Shares: 92 %  | <b>0.11</b> +/- 0.031<br>0.072 (0.062, 0.085)<br>Extreme Shares: 90 % | <b>0.1</b> +/- 0.032<br>0.081 (0.069, 0.095)<br>Extreme Shares: 94 %  |
| Dynamic Epsilon Greedy | <b>0.096</b> +/- 0.025<br>0.047 (0.041, 0.056)<br>Extreme Shares: 81 % | <b>0.14</b> +/- 0.032<br>0.081 (0.069, 0.095)<br>Extreme Shares: 80 % | <b>0.15</b> +/- 0.033<br>0.084 (0.072, 0.099)<br>Extreme Shares: 78 % |
| DynamicGreedy          | <b>0.12</b> +/- 0.029<br>0.065 (0.055, 0.076)<br>Extreme Shares: 79 %  | <b>0.19</b> +/- 0.038<br>0.11 (0.094, 0.13)<br>Extreme Shares: 80 %   | <b>0.19</b> +/- 0.035<br>0.093 (0.08, 0.11)<br>Extreme Shares: 72 %   |

## Results for HardMax t = 2000 Heavy Tail Info

|                        | Thompson Sampling   | Dynamic Epsilon Greedy   | DynamicGreedy  |
|------------------------|---|--|--|
| Thompson Sampling      | <b>0.11</b> +/- 0.033<br>0.086 (0.074, 0.1)<br>Extreme Shares: 96 % | <b>0.2</b> +/- 0.043<br>0.14 (0.12, 0.17)<br>Extreme Shares: 93 %  | <b>0.19</b> +/- 0.042<br>0.14 (0.12, 0.17)<br>Extreme Shares: 95 % |
| Dynamic Epsilon Greedy | <b>0.18</b> +/- 0.038<br>0.11 (0.098, 0.14)<br>Extreme Shares: 85 % | <b>0.22</b> +/- 0.042<br>0.14 (0.12, 0.16)<br>Extreme Shares: 84 % | <b>0.27</b> +/- 0.046<br>0.16 (0.14, 0.19)<br>Extreme Shares: 81 % |
| DynamicGreedy          | <b>0.2</b> +/- 0.041<br>0.13 (0.11, 0.15)<br>Extreme Shares: 84 %   | <b>0.3</b> +/- 0.048<br>0.18 (0.15, 0.21)<br>Extreme Shares: 85 %  | <b>0.26</b> +/- 0.043<br>0.14 (0.12, 0.17)<br>Extreme Shares: 77 % |

## Results for HardMax t = 2000 Heavy Tail Rep

|                        | Thompson Sampling   | Dynamic Epsilon Greedy  | DynamicGreedy   |
|------------------------|---|---|---|
| Thompson Sampling      | <b>0.051</b> +/- 0.021<br>0.034 (0.029, 0.04)<br>Extreme Shares: 94 % | <b>0.13</b> +/- 0.036<br>0.099 (0.085, 0.12)<br>Extreme Shares: 93 %  | <b>0.14</b> +/- 0.037<br>0.11 (0.093, 0.13)<br>Extreme Shares: 95 % |
| Dynamic Epsilon Greedy | <b>0.12</b> +/- 0.029<br>0.065 (0.056, 0.077)<br>Extreme Shares: 80 % | <b>0.14</b> +/- 0.031<br>0.074 (0.064, 0.088)<br>Extreme Shares: 79 % | <b>0.15</b> +/- 0.034<br>0.09 (0.077, 0.11)<br>Extreme Shares: 82 % |
| DynamicGreedy          | <b>0.19</b> +/- 0.04<br>0.12 (0.11, 0.15)<br>Extreme Shares: 86 %     | <b>0.23</b> +/- 0.041<br>0.13 (0.11, 0.15)<br>Extreme Shares: 76 %    | <b>0.18</b> +/- 0.034<br>0.087 (0.075, 0.1)<br>Extreme Shares: 71 % |

## Results for HardMaxWithRandom t = 2000 Heavy Tail Info + Rep

|                        | Thompson Sampling   | Dynamic Epsilon Greedy   | DynamicGreedy   |
|------------------------|---|--|---|
| Thompson Sampling      | <b>0.14</b> +/- 0.023<br>0.042 (0.036, 0.05)<br>Extreme Shares: 70 %  | <b>0.26</b> +/- 0.033<br>0.087 (0.074, 0.1)<br>Extreme Shares: 54 %  | <b>0.26</b> +/- 0.038<br>0.11 (0.098, 0.13)<br>Extreme Shares: 67 %   |
| Dynamic Epsilon Greedy | <b>0.19</b> +/- 0.026<br>0.053 (0.045, 0.062)<br>Extreme Shares: 57 % | <b>0.3</b> +/- 0.032<br>0.078 (0.066, 0.092)<br>Extreme Shares: 41 % | <b>0.3</b> +/- 0.035<br>0.093 (0.08, 0.11)<br>Extreme Shares: 48 %    |
| DynamicGreedy          | <b>0.27</b> +/- 0.032<br>0.077 (0.066, 0.091)<br>Extreme Shares: 49 % | <b>0.4</b> +/- 0.037<br>0.11 (0.091, 0.13)<br>Extreme Shares: 42 %   | <b>0.35</b> +/- 0.031<br>0.076 (0.065, 0.089)<br>Extreme Shares: 29 % |

## Results for HardMaxWithRandom t = 2000 Heavy Tail Info

|                        | Thompson Sampling   | Dynamic Epsilon Greedy   | DynamicGreedy  |
|------------------------|---|--|--|
| Thompson Sampling      | <b>0.17</b> +/- 0.029<br>0.065 (0.056, 0.077)<br>Extreme Shares: 72 % | <b>0.3</b> +/- 0.036<br>0.099 (0.085, 0.12)<br>Extreme Shares: 53 %  | <b>0.31</b> +/- 0.041<br>0.13 (0.11, 0.15)<br>Extreme Shares: 63 %   |
| Dynamic Epsilon Greedy | <b>0.23</b> +/- 0.031<br>0.073 (0.062, 0.086)<br>Extreme Shares: 57 % | <b>0.31</b> +/- 0.034<br>0.092 (0.079, 0.11)<br>Extreme Shares: 45 % | <b>0.32</b> +/- 0.037<br>0.11 (0.091, 0.13)<br>Extreme Shares: 50 %  |
| DynamicGreedy          | <b>0.3</b> +/- 0.034<br>0.087 (0.075, 0.1)<br>Extreme Shares: 46 %    | <b>0.44</b> +/- 0.039<br>0.12 (0.099, 0.14)<br>Extreme Shares: 41 %  | <b>0.38</b> +/- 0.035<br>0.096 (0.083, 0.11)<br>Extreme Shares: 35 % |

## Results for HardMaxWithRandom t = 2000 Heavy Tail Rep

|                        | Thompson Sampling   | Dynamic Epsilon Greedy   | DynamicGreedy  |
|------------------------|---|--|--|
| Thompson Sampling      | <b>0.21</b> +/- 0.032<br>0.081 (0.069, 0.096)<br>Extreme Shares: 66 % | <b>0.28</b> +/- 0.037<br>0.1 (0.089, 0.12)<br>Extreme Shares: 60 %   | <b>0.29</b> +/- 0.039<br>0.12 (0.1, 0.14)<br>Extreme Shares: 64 %    |
| Dynamic Epsilon Greedy | <b>0.25</b> +/- 0.033<br>0.087 (0.074, 0.1)<br>Extreme Shares: 57 %   | <b>0.34</b> +/- 0.034<br>0.091 (0.078, 0.11)<br>Extreme Shares: 40 % | <b>0.31</b> +/- 0.035<br>0.097 (0.083, 0.12)<br>Extreme Shares: 49 % |
| DynamicGreedy          | <b>0.3</b> +/- 0.036<br>0.099 (0.085, 0.12)<br>Extreme Shares: 52 %   | <b>0.4</b> +/- 0.037<br>0.11 (0.093, 0.13)<br>Extreme Shares: 40 %   | <b>0.35</b> +/- 0.033<br>0.086 (0.074, 0.1)<br>Extreme Shares: 35 %  |

## Results for SoftMax t = 2000 Heavy Tail Info + Rep

|                        | Thompson Sampling   | Dynamic Epsilon Greedy   | DynamicGreedy   |
|------------------------|---|--|---|
| Thompson Sampling      | <b>0.39</b> +/- 0.015<br>0.016 (0.014, 0.019)<br>Extreme Shares: 0.33 % | <b>0.51</b> +/- 0.018<br>0.026 (0.022, 0.03)<br>Extreme Shares: 0.67 % | <b>0.48</b> +/- 0.024<br>0.046 (0.039, 0.054)<br>Extreme Shares: 5 %  |
| Dynamic Epsilon Greedy | <b>0.34</b> +/- 0.017<br>0.022 (0.019, 0.026)<br>Extreme Shares: 5 %    | <b>0.43</b> +/- 0.018<br>0.024 (0.02, 0.028)<br>Extreme Shares: 3 %    | <b>0.43</b> +/- 0.023<br>0.042 (0.036, 0.05)<br>Extreme Shares: 1.3 % |
| DynamicGreedy          | <b>0.4</b> +/- 0.02<br>0.031 (0.027, 0.037)<br>Extreme Shares: 5.7 %    | <b>0.49</b> +/- 0.023<br>0.039 (0.034, 0.046)<br>Extreme Shares: 4.3 % | <b>0.47</b> +/- 0.016<br>0.02 (0.018, 0.024)<br>Extreme Shares: 1 %   |

## Results for SoftMax t = 2000 Heavy Tail Info

|                        | Thompson Sampling   | Dynamic Epsilon Greedy  | DynamicGreedy  |
|------------------------|---|---|--|
| Thompson Sampling      | <b>0.39</b> +/- 0.015<br>0.017 (0.015, 0.021)<br>Extreme Shares: 0.33 % | <b>0.52</b> +/- 0.019<br>0.027 (0.023, 0.032)<br>Extreme Shares: 0.67 % | <b>0.47</b> +/- 0.025<br>0.048 (0.041, 0.057)<br>Extreme Shares: 1.7 % |
| Dynamic Epsilon Greedy | <b>0.34</b> +/- 0.018<br>0.024 (0.021, 0.029)<br>Extreme Shares: 2.3 %  | <b>0.44</b> +/- 0.019<br>0.027 (0.023, 0.032)<br>Extreme Shares: 0.67 % | <b>0.41</b> +/- 0.023<br>0.04 (0.034, 0.048)<br>Extreme Shares: 2.3 %  |
| DynamicGreedy          | <b>0.41</b> +/- 0.021<br>0.034 (0.029, 0.04)<br>Extreme Shares: 4.3 %   | <b>0.5</b> +/- 0.022<br>0.039 (0.033, 0.046)<br>Extreme Shares: 3.3 %   | <b>0.46</b> +/- 0.018<br>0.024 (0.021, 0.028)<br>Extreme Shares: 1.3 % |

## Results for SoftMax t = 2000 Heavy Tail Rep

|                        | Thompson Sampling  | Dynamic Epsilon Greedy   | DynamicGreedy   |
|------------------------|--|--|---|
| Thompson Sampling      | <b>0.42</b> +/- 0.015<br>0.018 (0.015, 0.021)<br>Extreme Shares: 0 % | <b>0.53</b> +/- 0.02<br>0.031 (0.027, 0.037)<br>Extreme Shares: 0.67 % | <b>0.48</b> +/- 0.024<br>0.043 (0.037, 0.051)<br>Extreme Shares: 3.3 %  |
| Dynamic Epsilon Greedy | <b>0.36</b> +/- 0.02<br>0.03 (0.026, 0.035)<br>Extreme Shares: 4.7 % | <b>0.45</b> +/- 0.019<br>0.029 (0.024, 0.034)<br>Extreme Shares: 2 %   | <b>0.43</b> +/- 0.023<br>0.042 (0.036, 0.049)<br>Extreme Shares: 0.67 % |
| DynamicGreedy          | <b>0.42</b> +/- 0.022<br>0.037 (0.032, 0.044)<br>Extreme Shares: 5 % | <b>0.5</b> +/- 0.023<br>0.041 (0.035, 0.049)<br>Extreme Shares: 3.3 %  | <b>0.48</b> +/- 0.017<br>0.023 (0.02, 0.027)<br>Extreme Shares: 0.67 %  |

## Results for HardMax t = 2000 Uniform Info + Rep

|                        | Thompson Sampling   | Dynamic Epsilon Greedy   | DynamicGreedy  |
|------------------------|---|--|--|
| Thompson Sampling      | <b>0.11</b> +/- 0.029<br>0.067 (0.058, 0.08)<br>Extreme Shares: 86 %  | <b>0.17</b> +/- 0.035<br>0.097 (0.084, 0.12)<br>Extreme Shares: 79 % | <b>0.21</b> +/- 0.039<br>0.12 (0.1, 0.14)<br>Extreme Shares: 77 %    |
| Dynamic Epsilon Greedy | <b>0.15</b> +/- 0.032<br>0.082 (0.07, 0.096)<br>Extreme Shares: 80 %  | <b>0.18</b> +/- 0.035<br>0.092 (0.079, 0.11)<br>Extreme Shares: 74 % | <b>0.19</b> +/- 0.036<br>0.1 (0.087, 0.12)<br>Extreme Shares: 76 %   |
| DynamicGreedy          | <b>0.15</b> +/- 0.033<br>0.082 (0.071, 0.097)<br>Extreme Shares: 79 % | <b>0.18</b> +/- 0.035<br>0.097 (0.083, 0.11)<br>Extreme Shares: 78 % | <b>0.17</b> +/- 0.032<br>0.08 (0.069, 0.094)<br>Extreme Shares: 71 % |

## Results for HardMax t = 2000 Uniform Info

|                        | Thompson Sampling  | Dynamic Epsilon Greedy   | DynamicGreedy  |
|------------------------|--|--|--|
| Thompson Sampling      | <b>0.34</b> +/- 0.05<br>0.2 (0.17, 0.23)<br>Extreme Shares: 87 %   | <b>0.32</b> +/- 0.049<br>0.19 (0.16, 0.22)<br>Extreme Shares: 86 % | <b>0.32</b> +/- 0.049<br>0.18 (0.16, 0.22)<br>Extreme Shares: 85 % |
| Dynamic Epsilon Greedy | <b>0.32</b> +/- 0.048<br>0.18 (0.16, 0.21)<br>Extreme Shares: 85 % | <b>0.33</b> +/- 0.048<br>0.18 (0.15, 0.21)<br>Extreme Shares: 81 % | <b>0.3</b> +/- 0.046<br>0.16 (0.14, 0.19)<br>Extreme Shares: 76 %  |
| DynamicGreedy          | <b>0.34</b> +/- 0.05<br>0.19 (0.17, 0.23)<br>Extreme Shares: 84 %  | <b>0.32</b> +/- 0.047<br>0.17 (0.15, 0.21)<br>Extreme Shares: 80 % | <b>0.31</b> +/- 0.047<br>0.17 (0.15, 0.2)<br>Extreme Shares: 78 %  |

## Results for HardMax t = 2000 Uniform Rep

|                        | Thompson Sampling   | Dynamic Epsilon Greedy  | DynamicGreedy   |
|------------------------|---|---|---|
| Thompson Sampling      | <b>0.19</b> +/- 0.039<br>0.12 (0.099, 0.14)<br>Extreme Shares: 83 % | <b>0.18</b> +/- 0.038<br>0.11 (0.098, 0.14)<br>Extreme Shares: 85 % | <b>0.2</b> +/- 0.039<br>0.12 (0.1, 0.14)<br>Extreme Shares: 82 %    |
| Dynamic Epsilon Greedy | <b>0.2</b> +/- 0.039<br>0.12 (0.1, 0.14)<br>Extreme Shares: 80 %    | <b>0.23</b> +/- 0.04<br>0.12 (0.11, 0.15)<br>Extreme Shares: 76 %   | <b>0.23</b> +/- 0.039<br>0.12 (0.1, 0.14)<br>Extreme Shares: 74 %   |
| DynamicGreedy          | <b>0.2</b> +/- 0.039<br>0.12 (0.1, 0.14)<br>Extreme Shares: 81 %    | <b>0.2</b> +/- 0.037<br>0.11 (0.093, 0.13)<br>Extreme Shares: 77 %  | <b>0.23</b> +/- 0.038<br>0.11 (0.096, 0.13)<br>Extreme Shares: 70 % |

## Results for HardMaxWithRandom t = 2000 Uniform Info + Rep

|                        | Thompson Sampling   | Dynamic Epsilon Greedy  | DynamicGreedy   |
|------------------------|---|---|---|
| Thompson Sampling      | <b>0.25</b> +/- 0.03<br>0.07 (0.06, 0.083)<br>Extreme Shares: 48 %  | <b>0.31</b> +/- 0.035<br>0.094 (0.08, 0.11)<br>Extreme Shares: 45 %   | <b>0.35</b> +/- 0.037<br>0.11 (0.091, 0.13)<br>Extreme Shares: 48 %   |
| Dynamic Epsilon Greedy | <b>0.3</b> +/- 0.032<br>0.08 (0.069, 0.095)<br>Extreme Shares: 41 % | <b>0.35</b> +/- 0.035<br>0.094 (0.08, 0.11)<br>Extreme Shares: 39 %   | <b>0.39</b> +/- 0.033<br>0.087 (0.075, 0.1)<br>Extreme Shares: 30 %   |
| DynamicGreedy          | <b>0.3</b> +/- 0.033<br>0.087 (0.074, 0.1)<br>Extreme Shares: 42 %  | <b>0.31</b> +/- 0.031<br>0.075 (0.065, 0.089)<br>Extreme Shares: 38 % | <b>0.38</b> +/- 0.031<br>0.073 (0.063, 0.087)<br>Extreme Shares: 28 % |

## Results for HardMaxWithRandom t = 2000 Uniform Info

|                        | Thompson Sampling  | Dynamic Epsilon Greedy   | DynamicGreedy   |
|------------------------|--|--|---|
| Thompson Sampling      | <b>0.32</b> +/- 0.036<br>0.1 (0.087, 0.12)<br>Extreme Shares: 49 %   | <b>0.36</b> +/- 0.036<br>0.1 (0.088, 0.12)<br>Extreme Shares: 42 % | <b>0.42</b> +/- 0.04<br>0.12 (0.11, 0.15)<br>Extreme Shares: 48 %   |
| Dynamic Epsilon Greedy | <b>0.35</b> +/- 0.036<br>0.098 (0.084, 0.12)<br>Extreme Shares: 42 % | <b>0.36</b> +/- 0.036<br>0.1 (0.087, 0.12)<br>Extreme Shares: 43 % | <b>0.39</b> +/- 0.036<br>0.1 (0.086, 0.12)<br>Extreme Shares: 37 %  |
| DynamicGreedy          | <b>0.35</b> +/- 0.035<br>0.094 (0.08, 0.11)<br>Extreme Shares: 39 %  | <b>0.39</b> +/- 0.037<br>0.11 (0.09, 0.12)<br>Extreme Shares: 39 % | <b>0.4</b> +/- 0.035<br>0.093 (0.079, 0.11)<br>Extreme Shares: 33 % |

## Results for HardMaxWithRandom t = 2000 Uniform Rep

|                        | Thompson Sampling  | Dynamic Epsilon Greedy   | DynamicGreedy  |
|------------------------|--|--|--|
| Thompson Sampling      | <b>0.34</b> +/- 0.036<br>0.1 (0.086, 0.12)<br>Extreme Shares: 46 %   | <b>0.33</b> +/- 0.037<br>0.11 (0.092, 0.13)<br>Extreme Shares: 49 %  | <b>0.38</b> +/- 0.039<br>0.12 (0.1, 0.14)<br>Extreme Shares: 46 %    |
| Dynamic Epsilon Greedy | <b>0.33</b> +/- 0.036<br>0.1 (0.086, 0.12)<br>Extreme Shares: 48 %   | <b>0.36</b> +/- 0.036<br>0.1 (0.087, 0.12)<br>Extreme Shares: 40 %   | <b>0.39</b> +/- 0.036<br>0.099 (0.085, 0.12)<br>Extreme Shares: 37 % |
| DynamicGreedy          | <b>0.35</b> +/- 0.036<br>0.098 (0.084, 0.12)<br>Extreme Shares: 42 % | <b>0.36</b> +/- 0.036<br>0.098 (0.084, 0.12)<br>Extreme Shares: 40 % | <b>0.41</b> +/- 0.034<br>0.088 (0.076, 0.1)<br>Extreme Shares: 28 %  |

## Results for SoftMax t = 2000 Uniform Info + Rep

|                        | Thompson Sampling  | Dynamic Epsilon Greedy  | DynamicGreedy   |
|------------------------|--|---|---|
| Thompson Sampling      | <b>0.42</b> +/- 0.019<br>0.029 (0.025, 0.034)<br>Extreme Shares: 1.3 % | <b>0.46</b> +/- 0.022<br>0.037 (0.032, 0.044)<br>Extreme Shares: 1 %  | <b>0.47</b> +/- 0.026<br>0.053 (0.045, 0.062)<br>Extreme Shares: 0.33 % |
| Dynamic Epsilon Greedy | <b>0.4</b> +/- 0.022<br>0.038 (0.033, 0.045)<br>Extreme Shares: 4.7 %  | <b>0.45</b> +/- 0.021<br>0.035 (0.03, 0.042)<br>Extreme Shares: 1.7 % | <b>0.47</b> +/- 0.024<br>0.044 (0.037, 0.052)<br>Extreme Shares: 1.3 %  |
| DynamicGreedy          | <b>0.41</b> +/- 0.023<br>0.039 (0.034, 0.047)<br>Extreme Shares: 4 %   | <b>0.44</b> +/- 0.023<br>0.04 (0.034, 0.047)<br>Extreme Shares: 3.3 % | <b>0.48</b> +/- 0.023<br>0.039 (0.034, 0.046)<br>Extreme Shares: 0.67 % |

## Results for SoftMax t = 2000 Uniform Info

|                        | Thompson Sampling   | Dynamic Epsilon Greedy   | DynamicGreedy   |
|------------------------|---|--|---|
| Thompson Sampling      | <b>0.44</b> +/- 0.019<br>0.029 (0.025, 0.034)<br>Extreme Shares: 0 %    | <b>0.46</b> +/- 0.022<br>0.036 (0.031, 0.043)<br>Extreme Shares: 1 %   | <b>0.49</b> +/- 0.025<br>0.047 (0.04, 0.055)<br>Extreme Shares: 2.3 % |
| Dynamic Epsilon Greedy | <b>0.42</b> +/- 0.019<br>0.029 (0.025, 0.034)<br>Extreme Shares: 0.33 % | <b>0.46</b> +/- 0.023<br>0.041 (0.035, 0.049)<br>Extreme Shares: 2 %   | <b>0.49</b> +/- 0.024<br>0.043 (0.037, 0.051)<br>Extreme Shares: 1 %  |
| DynamicGreedy          | <b>0.42</b> +/- 0.024<br>0.043 (0.037, 0.051)<br>Extreme Shares: 4.3 %  | <b>0.45</b> +/- 0.024<br>0.045 (0.038, 0.053)<br>Extreme Shares: 4.7 % | <b>0.46</b> +/- 0.022<br>0.036 (0.031, 0.042)<br>Extreme Shares: 2 %  |

## Results for SoftMax t = 2000 Uniform Rep

|                        | Thompson Sampling  | Dynamic Epsilon Greedy  | DynamicGreedy   |
|------------------------|--|---|---|
| Thompson Sampling      | <b>0.46</b> +/- 0.02<br>0.03 (0.026, 0.035)<br>Extreme Shares: 0.33 %  | <b>0.47</b> +/- 0.022<br>0.038 (0.033, 0.045)<br>Extreme Shares: 0.67 % | <b>0.51</b> +/- 0.026<br>0.053 (0.046, 0.063)<br>Extreme Shares: 1.7 %  |
| Dynamic Epsilon Greedy | <b>0.45</b> +/- 0.024<br>0.043 (0.037, 0.051)<br>Extreme Shares: 2.7 % | <b>0.44</b> +/- 0.022<br>0.038 (0.033, 0.045)<br>Extreme Shares: 3.3 %  | <b>0.48</b> +/- 0.023<br>0.041 (0.035, 0.048)<br>Extreme Shares: 0.67 % |
| DynamicGreedy          | <b>0.46</b> +/- 0.026<br>0.053 (0.046, 0.063)<br>Extreme Shares: 3.7 % | <b>0.46</b> +/- 0.023<br>0.041 (0.035, 0.048)<br>Extreme Shares: 2.7 %  | <b>0.48</b> +/- 0.023<br>0.041 (0.035, 0.048)<br>Extreme Shares: 1.7 %  |

## Results for HardMax t = 2000 Needle In Haystack High Info + Rep

|                        | Thompson Sampling  | Dynamic Epsilon Greedy  | DynamicGreedy  |
|------------------------|--|---|--|
| Thompson Sampling      | <b>0.068</b> +/- 0.023<br>0.04 (0.035, 0.048)<br>Extreme Shares: 89 %  | <b>0.14</b> +/- 0.035<br>0.096 (0.082, 0.11)<br>Extreme Shares: 89 %  | <b>0.23</b> +/- 0.044<br>0.15 (0.13, 0.18)<br>Extreme Shares: 87 % |
| Dynamic Epsilon Greedy | <b>0.08</b> +/- 0.024<br>0.044 (0.038, 0.052)<br>Extreme Shares: 87 %  | <b>0.14</b> +/- 0.033<br>0.086 (0.074, 0.1)<br>Extreme Shares: 86 %   | <b>0.2</b> +/- 0.039<br>0.12 (0.1, 0.14)<br>Extreme Shares: 80 %   |
| DynamicGreedy          | <b>0.093</b> +/- 0.028<br>0.061 (0.052, 0.072)<br>Extreme Shares: 90 % | <b>0.12</b> +/- 0.032<br>0.078 (0.067, 0.092)<br>Extreme Shares: 86 % | <b>0.2</b> +/- 0.038<br>0.11 (0.094, 0.13)<br>Extreme Shares: 76 % |

## Results for HardMax t = 2000 Needle In Haystack High Info

|                        | Thompson Sampling   | Dynamic Epsilon Greedy   | DynamicGreedy  |
|------------------------|---|--|--|
| Thompson Sampling      | <b>0.31</b> +/- 0.05<br>0.2 (0.17, 0.23)<br>Extreme Shares: 93 %  | <b>0.28</b> +/- 0.049<br>0.18 (0.16, 0.22)<br>Extreme Shares: 92 % | <b>0.34</b> +/- 0.051<br>0.2 (0.17, 0.24)<br>Extreme Shares: 90 %  |
| Dynamic Epsilon Greedy | <b>0.27</b> +/- 0.047<br>0.17 (0.15, 0.2)<br>Extreme Shares: 88 % | <b>0.3</b> +/- 0.049<br>0.19 (0.16, 0.22)<br>Extreme Shares: 90 %  | <b>0.37</b> +/- 0.051<br>0.2 (0.17, 0.24)<br>Extreme Shares: 86 %  |
| DynamicGreedy          | <b>0.26</b> +/- 0.046<br>0.17 (0.14, 0.2)<br>Extreme Shares: 89 % | <b>0.33</b> +/- 0.05<br>0.19 (0.17, 0.23)<br>Extreme Shares: 88 %  | <b>0.34</b> +/- 0.048<br>0.18 (0.15, 0.21)<br>Extreme Shares: 80 % |

## Results for HardMax t = 2000 Needle In Haystack High Rep

|                        | Thompson Sampling  | Dynamic Epsilon Greedy   | DynamicGreedy  |
|------------------------|--|--|--|
| Thompson Sampling      | <b>0.14</b> +/- 0.035<br>0.094 (0.081, 0.11)<br>Extreme Shares: 90 % | <b>0.21</b> +/- 0.044<br>0.15 (0.13, 0.18)<br>Extreme Shares: 94 %   | <b>0.31</b> +/- 0.047<br>0.17 (0.15, 0.21)<br>Extreme Shares: 82 % |
| Dynamic Epsilon Greedy | <b>0.15</b> +/- 0.036<br>0.099 (0.085, 0.12)<br>Extreme Shares: 88 % | <b>0.2</b> +/- 0.04<br>0.13 (0.11, 0.15)<br>Extreme Shares: 85 %     | <b>0.22</b> +/- 0.04<br>0.13 (0.11, 0.15)<br>Extreme Shares: 78 %  |
| DynamicGreedy          | <b>0.15</b> +/- 0.037<br>0.11 (0.091, 0.13)<br>Extreme Shares: 93 %  | <b>0.15</b> +/- 0.034<br>0.092 (0.079, 0.11)<br>Extreme Shares: 86 % | <b>0.19</b> +/- 0.036<br>0.1 (0.086, 0.12)<br>Extreme Shares: 73 % |

## Results for HardMaxWithRandom t = 2000 Needle In Haystack High Info + Rep

|                        | Thompson Sampling   | Dynamic Epsilon Greedy   | DynamicGreedy  |
|------------------------|---|--|--|
| Thompson Sampling      | <b>0.18</b> +/- 0.026<br>0.053 (0.046, 0.063)<br>Extreme Shares: 61 % | <b>0.26</b> +/- 0.035<br>0.095 (0.081, 0.11)<br>Extreme Shares: 60 % | <b>0.44</b> +/- 0.044<br>0.15 (0.13, 0.18)<br>Extreme Shares: 61 %   |
| Dynamic Epsilon Greedy | <b>0.23</b> +/- 0.031<br>0.072 (0.062, 0.085)<br>Extreme Shares: 57 % | <b>0.3</b> +/- 0.034<br>0.092 (0.079, 0.11)<br>Extreme Shares: 51 %  | <b>0.45</b> +/- 0.039<br>0.12 (0.1, 0.14)<br>Extreme Shares: 42 %    |
| DynamicGreedy          | <b>0.26</b> +/- 0.033<br>0.083 (0.071, 0.098)<br>Extreme Shares: 54 % | <b>0.3</b> +/- 0.035<br>0.094 (0.08, 0.11)<br>Extreme Shares: 51 %   | <b>0.39</b> +/- 0.035<br>0.097 (0.083, 0.11)<br>Extreme Shares: 36 % |

## Results for HardMaxWithRandom t = 2000 Needle In Haystack High Info

|                        | Thompson Sampling   | Dynamic Epsilon Greedy  | DynamicGreedy  |
|------------------------|---|---|--|
| Thompson Sampling      | <b>0.3</b> +/- 0.036<br>0.1 (0.086, 0.12)<br>Extreme Shares: 55 %   | <b>0.34</b> +/- 0.041<br>0.13 (0.11, 0.15)<br>Extreme Shares: 59 %  | <b>0.49</b> +/- 0.044<br>0.15 (0.13, 0.18)<br>Extreme Shares: 61 %   |
| Dynamic Epsilon Greedy | <b>0.32</b> +/- 0.037<br>0.11 (0.091, 0.13)<br>Extreme Shares: 51 % | <b>0.36</b> +/- 0.038<br>0.11 (0.095, 0.13)<br>Extreme Shares: 49 % | <b>0.47</b> +/- 0.039<br>0.12 (0.1, 0.14)<br>Extreme Shares: 43 %    |
| DynamicGreedy          | <b>0.34</b> +/- 0.038<br>0.11 (0.095, 0.13)<br>Extreme Shares: 55 % | <b>0.35</b> +/- 0.038<br>0.11 (0.094, 0.13)<br>Extreme Shares: 50 % | <b>0.41</b> +/- 0.036<br>0.098 (0.084, 0.12)<br>Extreme Shares: 37 % |

## Results for HardMaxWithRandom t = 2000 Needle In Haystack High Rep

|                        | Thompson Sampling   | Dynamic Epsilon Greedy  | DynamicGreedy  |
|------------------------|---|---|--|
| Thompson Sampling      | <b>0.28</b> +/- 0.039<br>0.12 (0.099, 0.14)<br>Extreme Shares: 64 % | <b>0.38</b> +/- 0.044<br>0.15 (0.13, 0.17)<br>Extreme Shares: 65 %  | <b>0.43</b> +/- 0.044<br>0.15 (0.13, 0.17)<br>Extreme Shares: 57 %   |
| Dynamic Epsilon Greedy | <b>0.3</b> +/- 0.038<br>0.11 (0.095, 0.13)<br>Extreme Shares: 58 %  | <b>0.34</b> +/- 0.038<br>0.11 (0.098, 0.14)<br>Extreme Shares: 53 % | <b>0.45</b> +/- 0.04<br>0.12 (0.1, 0.14)<br>Extreme Shares: 43 %     |
| DynamicGreedy          | <b>0.3</b> +/- 0.036<br>0.1 (0.088, 0.12)<br>Extreme Shares: 55 %   | <b>0.34</b> +/- 0.038<br>0.11 (0.094, 0.13)<br>Extreme Shares: 52 % | <b>0.39</b> +/- 0.035<br>0.094 (0.081, 0.11)<br>Extreme Shares: 36 % |



## Results for SoftMax t = 2000 Needle In Haystack High Info + Rep

|                        | Thompson Sampling  | Dynamic Epsilon Greedy   | DynamicGreedy  |
|------------------------|--|--|--|
| Thompson Sampling      | <b>0.37</b> +/- 0.018<br>0.026 (0.022, 0.03)<br>Extreme Shares: 1 %    | <b>0.43</b> +/- 0.024<br>0.044 (0.038, 0.052)<br>Extreme Shares: 3 %   | <b>0.53</b> +/- 0.032<br>0.078 (0.067, 0.092)<br>Extreme Shares: 4.3 % |
| Dynamic Epsilon Greedy | <b>0.35</b> +/- 0.022<br>0.036 (0.031, 0.043)<br>Extreme Shares: 8.7 % | <b>0.42</b> +/- 0.025<br>0.047 (0.041, 0.056)<br>Extreme Shares: 5.7 % | <b>0.54</b> +/- 0.028<br>0.059 (0.051, 0.07)<br>Extreme Shares: 2.3 %  |
| DynamicGreedy          | <b>0.35</b> +/- 0.024<br>0.045 (0.038, 0.053)<br>Extreme Shares: 9 %   | <b>0.4</b> +/- 0.026<br>0.052 (0.045, 0.062)<br>Extreme Shares: 8 %    | <b>0.47</b> +/- 0.024<br>0.045 (0.038, 0.053)<br>Extreme Shares: 4.7 % |

## Results for SoftMax t = 2000 Needle In Haystack High Info

|                        | Thompson Sampling  | Dynamic Epsilon Greedy   | DynamicGreedy   |
|------------------------|--|--|---|
| Thompson Sampling      | <b>0.38</b> +/- 0.019<br>0.028 (0.024, 0.033)<br>Extreme Shares: 1.3 % | <b>0.45</b> +/- 0.024<br>0.046 (0.039, 0.054)<br>Extreme Shares: 3 %   | <b>0.53</b> +/- 0.031<br>0.076 (0.065, 0.09)<br>Extreme Shares: 7.3 % |
| Dynamic Epsilon Greedy | <b>0.38</b> +/- 0.023<br>0.042 (0.036, 0.049)<br>Extreme Shares: 4.7 % | <b>0.44</b> +/- 0.026<br>0.051 (0.044, 0.06)<br>Extreme Shares: 3.7 %  | <b>0.53</b> +/- 0.027<br>0.058 (0.05, 0.069)<br>Extreme Shares: 5.7 % |
| DynamicGreedy          | <b>0.38</b> +/- 0.027<br>0.055 (0.047, 0.065)<br>Extreme Shares: 8.3 % | <b>0.41</b> +/- 0.027<br>0.058 (0.049, 0.068)<br>Extreme Shares: 8.7 % | <b>0.5</b> +/- 0.025<br>0.048 (0.042, 0.057)<br>Extreme Shares: 4 %   |

## Results for SoftMax t = 2000 Needle In Haystack High Rep

|                        | Thompson Sampling  | Dynamic Epsilon Greedy   | DynamicGreedy  |
|------------------------|--|--|--|
| Thompson Sampling      | <b>0.42</b> +/- 0.023<br>0.04 (0.034, 0.047)<br>Extreme Shares: 0.67 % | <b>0.49</b> +/- 0.026<br>0.053 (0.045, 0.063)<br>Extreme Shares: 2 %   | <b>0.54</b> +/- 0.031<br>0.073 (0.063, 0.086)<br>Extreme Shares: 2.7 % |
| Dynamic Epsilon Greedy | <b>0.42</b> +/- 0.026<br>0.05 (0.043, 0.06)<br>Extreme Shares: 4 %     | <b>0.46</b> +/- 0.026<br>0.052 (0.044, 0.061)<br>Extreme Shares: 3 %   | <b>0.5</b> +/- 0.028<br>0.06 (0.051, 0.071)<br>Extreme Shares: 3 %     |
| DynamicGreedy          | <b>0.39</b> +/- 0.029<br>0.066 (0.057, 0.078)<br>Extreme Shares: 8.7 % | <b>0.41</b> +/- 0.026<br>0.053 (0.045, 0.062)<br>Extreme Shares: 5.7 % | <b>0.48</b> +/- 0.026<br>0.052 (0.044, 0.061)<br>Extreme Shares: 3.3 % |