x - queried k-mer (not sampled) x'- sampled k-mer (nearest) pos(x) = pos[rank(IsSamp[h(x')])] - 4pos[rank(IsSamp[h(x')])] h(x')X= CAGCCGC **MPHF** h(x) **Extension Vector Unipath Array IsSamp** TCACGGCGGCTGTCCTG ••• 1000000001000 T000 CT00 | **IsCanon** 0110000001000 h(x) - rank(IsSamp[h(x)])ACT0 **Direction CACT** -00001111-000 **TCCT GCGGCTG** CCT0 k' -GCGGCTGTCCT = x'CT00 T000